World War II Winter and Mountain Warfare Tactics

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ILLUSTRATED BY STEVE NOON

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Elite • 193

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Series editor Martin Windrow

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WORLD WAR II WINTER AND MOUNTAIN WARFARE TACTICS

INTRODUCTION

> *'Troops who are to be organized into a march column should be kept in motion during severe cold… In deep snow, severe cold, and strong wind, the front ranks marching against the wind must be relieved frequently. Horsemen must usually dismount and proceed on foot… Regulations on wearing the uniform, or special measures for protection against cold, must be revised and adapted to local conditions… Guards must be detailed to wake up all the men individually to prevent them from freezing'.*

One might be forgiven for assuming that these are orders from Napoleon's 1812 retreat from Moscow. In fact this is a quotation from *Taschenbuch für den Winterkrieg*, the 'Pocketbook for Winter Warfare', published in August 1942. By that date the German Army had realized that their war in the East might last for several more demoralizing winters, and that all troops, not just specialists, must be physically, mentally and morally prepared for the ordeal. New tactics and equipment were vital – as was reversion to methods long since learned, but frequently forgotten.

This study is not a campaign history; nor do we cover here the basics of infantry tactics (these being addressed in Elite Nos.105 and 122).[1] Our focus here is techniques employed in particular climatic and geographic conditions – cold, and mountainous terrain (which are not always the same thing) – and their impact on combat. Although we cover only the major combatant armies and European theatres, there is ample subject-matter, since mountain and winter combat operations were surprisingly prevalent between 1939 and 1945. Such actions took place all along the Eastern Front at various times, but there were also prolonged struggles in Italy, the Balkans and Scandinavia. Even in the West there were battles in the mountains of France and the winter snows of the Ardennes. In this total war, the 'campaigning seasons' of old went unacknowledged; both the enemy, and nature, had to be confronted the whole year round. In learning how to do so, it was natural that mass armies initially drew upon both foreign experience, and (if they had any) upon the specialists serving in their mountain units.

1 See ELI 105, *World War II Infantry Tactics: Squad & Platoon*; and ELI 122, *World War II Infantry Tactics: Company & Battalion*

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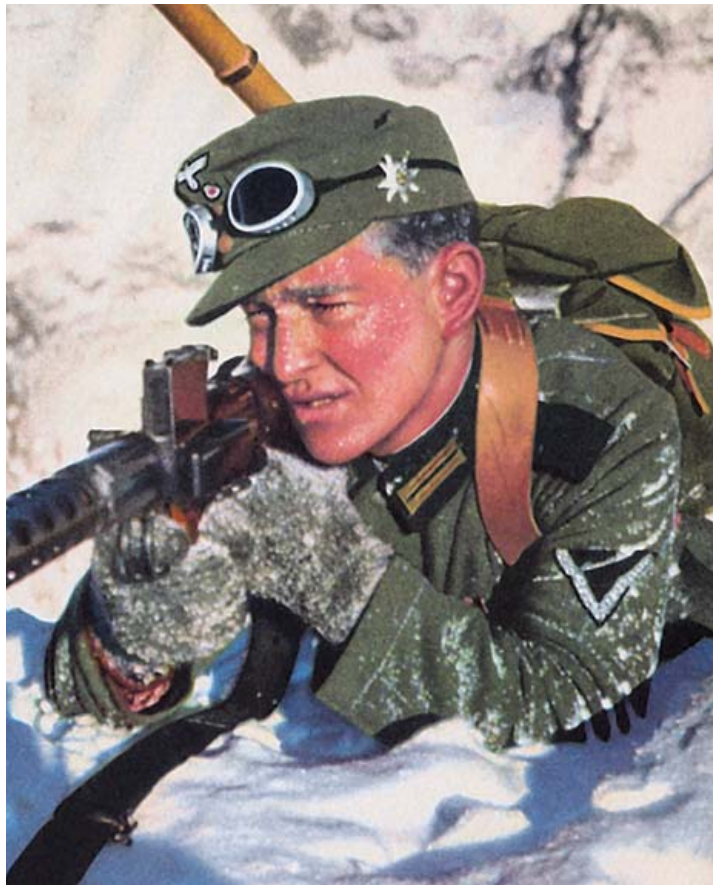
It may not be widely realized that skis were used by medieval Norwegian soldiers in the 13th century; formal military ski training existed by the 17th century, and light artillery on sleds was a feature of Norwegian armies soon afterwards. The French formed specialized battalions of Chasseurs Alpins in the 19th century, and in 1891 Russian ski troops set an almost incredible ten-day endurance record over a distance of 1,115 miles. Britain gleaned experience through long-term exposure to winter conditions in Canada and during Polar and Himalayan exploration, and established a mountain warfare school in India as early as 1916 to support operations on the North-West Frontier (today's Pakistan/Afghanistan border country). During World War I Austrian, German, Italian and French ski and mountain units saw action in the Alps and the Balkans, supported by mountain artillery and other specialists.

Though military spending dwindled during the 1920s, the Norwegians formed a winter warfare school under Maj Finn Qvale in 1923. Although basic Norwegian Army uniform remained substantially unaltered, garments of sheep- and reindeer-skin, and specialist equipments inspired by the Sami people of the Arctic and other civilian models, were used at this school. By the 1930s the school yearbook featured illustrations of lightweight sleds, carts with skis fitted to wheels, standard-pattern snowshoes for horses, and machine-gun base plates to spread weight over soft snow.

This was also the era of romantic 'mountain movies' – the *Bergfilm* – and of the commercial exploitation of skiing and mountaineering as leisure activities for the rich and adventurous. The Winter Olympics undoubtedly played its part in popularizing mountain sports: 'Nordic' cross-country skiing was introduced at Chamonix in 1924, as was a 'military patrol' event of skiing and shooting, later renamed 'biathlon'. At the Bavarian Garmisch-Partenkirchen games, opened by Hitler in 1936, 'Alpine' skiing, downhill and slalom, appeared for the first time. Whilst Norway was the top medal-winning nation, the host country took gold for Alpine skiing (and, remarkably, Britain beat Canada in the ice hockey). In the field of mountaineering, the invention of synthetic fibres in the 1930s led to a new generation of ropes with superior qualities to traditional hemp.



Pre-war posed portrait of a sun-tanned German soldier of one of the specialist mountain units recruited mostly in Bavaria and Austria; the red lines on his collar *Litzen* seem to identify the Gebirgsartillerie branch. He wears the short-visored *Gebirgsmütze* mountain cap with the prized Edelweiss badge of the Mountain Troops pinned on the left side, and a pair of *Schneebrille* tinted goggles to protect against 'snow blindness'; note too his mountain rucksack. The weapon is the MG13 light machine gun, fed from 25-round detachable box magazines; by the outbreak of war it had been replaced in both line infantry and mountain units with the superior general-purpose MG34.

German preparations

New German tactical foundations were laid in 1935 with the publication of provisional training instructions for mountain troops. These recognized the special issues of

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Württemberg mountain gunners photographed at Ludwigsburg at the end of World War I. The gun is a wooden-wheeled 7.5cm Gebirgskanone; similar pieces were still in service in World War II alongside more modern weapons. The crew wear *ski-Litewka* jackets, mountain boots with high strapped gaiters, and mountain caps; the man at front centre carries a Mauser C96 semi-automatic pistol in its distinctive wooden holster-stock.

command, wide fronts and scattered engagements demonstrated in World War I. They also foresaw a significant role for small bodies of trained men in impeding, channelling and harassing enemy main forces, sapping their strength and forcing them to fight at disadvantage. In the offensive, mountain troops would secure the advance, and in defence they would deny valleys to the enemy by gaining control of heights. Usually the mountain infantry battalion would be the largest tactical unit employed for independent missions, with an emphasis on the support of machine guns, mortars, and light artillery, since much terrain would be inaccessible to tanks and other vehicles. The battalion commander would have to exploit routes by combat reconnaissance, moving where possible under cover or by night, and deploy his heavy weapons profitably. Ideally, he would hold reserves near elevations and crests ready to attack downhill, and be prepared to pursue aggressively, often without artillery support.

Oberleutnant Braun of 12 Kompanie, Gebirgsjäger Regiment 99, who was captain of the 'officers reconnaissance patrol' team in the Army Ski Championships. Note the relatively long, narrow skis preferred by an expert in cross-country work, compared with the broader issue skis illustrated on page 47.

Squad leaders would have to take considerable responsibility, often advancing through pathless terrain in single file, and at considerable extension so as to avoid 'accordion movements' and forced changes of pace within the column. In many situations the *Gruppe* (squad or section) would have to furnish their own support by the overhead or flanking fire of their light machine gun. Surprise was desirable, but it was also recognized that difficult climbs were not possible under effective enemy fire.

Confirmation of a revival of the German mountain troops arm came in April 1938 with the formation of 1.Gebirgs Division at Garmisch-Partenkirchen under GenMaj Ludwig Kübler, achieved by the expansion and reorganization of the existing mountain brigade. Germany's annexation of Austria that same year allowed the creation of a 2nd Mountain Division at Innsbruck, and a 3rd at Graz, both from Austrian troops. These formations included mountain artillery and mortars, anti-tank companies, engineers, signals, mapping detachments, pack-animal and veterinary companies, plus motorized supply, medical, and maintenance units, and even 'weather detachments'.

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This was just the beginning, and eventually Germany would have ten Army mountain divisions and a Skijäger Division, plus six Waffen-SS mountain divisions.

Several other nations, including the British and Americans, would later raise specialist forces in imitation. Perhaps more importantly, however, large parts of the armies of several of the major combatants would learn, in time, to live and fight in serious winter conditions.

THE PARAMETERS OF COMBAT: CLIMATE & TERRAIN

'The Russian winter brings long-lasting deep frozen cold, as low as minus 40 to minus 50 degrees [Centigrade], sometimes alternating with short periods of thaw, snow fall, fog and unpredictable weather': *Taschenbuch für den Winterkrieg* (1942).

Just as there are different types of snow, there are different categories of cold. In the 1940s US military meteorologists divided these into three. In 'wet cold' – encountered in areas of the maritime sub-Arctic, and at the changing of seasons elsewhere – the temperature is often above freezing, sometimes with heavy precipitation. Many regions subject to such a climate are also characterized by bogs, mud, flooding, and mosquito infestation, yet even where the surface is liquid at some latitudes subsoils remain permanently frozen. In 'heavy winter' conditions at non-Arctic latitudes, where temperatures fluctuate above and below freezing, deep snow is often the result; examples include the winters of Southern Germany, and in parts of New England. In 'extreme dry cold', the temperature remains well below freezing, and from about minus 20° C the air begins to lose its ability to retain moisture. Phenomena encountered in extreme cold include temperature inversions, mirages, and 'ice fog', in which moisture becomes clouds of ice crystals. Sounds travel incredible distances – for example, a man chopping wood can occasionally be heard at a range of ten miles. In sub-Arctic continental areas year-round temperatures vary wildly: in central Siberia,

Fort Snelling, Minnesota, March 1939: a US Army two-man team demonstrate the use of a .30cal M1917 Browning machine gun from under the rudimentary camouflage of a white sheet. With his greatcoat the gunner wears a white cap cover and long 'trail' snowshoes.

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for example, temperatures as low as minus 68° C and as high as 32° C (minus 90° F to plus 90° F) have been recorded. Even in Italy the winter of 1944 was cold, with more than 40 nights when the temperature dropped below freezing.

As the German winter warfare manual explained, in slightly cold weather large snow crystals or flakes formed a loose ground surface, but in severe cold and strong wind tiny grains quickly packed hard. A hard crust on soft, deep snow might permit reasonable movement, but a fine crust was a different proposition: soldiers' feet would break through and could only be extricated for another step with difficulty, and skiers were in danger of injury. Moreover, at different times of day the load-bearing capacity might vary, so that in the cold shadows sledges and dogs passed without difficulty, and in sunlight they sank through the crust.

As the September 1941 US manual *Operations in Snow and Extreme Cold* pointed out, climate could 'profoundly affect' the conduct of troops in the field. Deep snow and drifts impeded progress on- and off-road, and cold caused the hardening of vehicle and weapon lubricants, frost-fogging of optics, condensation, and brittleness in rubber. It made ground too hard to dig, reduced efficiency in electrical equipment, gave animals frosted lungs and other ailments, and caused human frostbite, snow blindness and numbness. Cold was intensified by wind; as the US *Arctic Manual* of 1944 put it:

> Winds are disagreeable enough when associated with cold, but when they are also accompanied by drifting snow they are wicked and at times make travelling almost impossible… Winds of 9 to 12mph will raise the snow a few feet off the ground so that the blowing snow obscures surface objects such as rocks and runway markers. This is particularly true… where there are no trees to break the wind… Winds of 15mph or more will raise snow high enough to obscure buildings. At wind speeds above 30mph snow may be whisked up 50 or 100 feet and appear like low cloud.

As German instructions pointed out, in high mountains almost everything was more difficult and took more time than on flat terrain. Weather conditions changed suddenly and dramatically. Deployments were restricted, march columns long and narrow, and 'superficial knowledge and ignorance or underestimation' might result in 'catastrophe'. Such factors added up to limitation of movement, difficulty of supply, increased rates of 'non-battle' casualties, and an emphasis on the importance of infantry over heavy ordnance, wheeled vehicles, and anything else that was difficult to shift through snow or on steep inclines. As British observers also noted, mountain warfare in particular tended to funnel troops into 'deep columns' along the main valleys, restricting lateral

Southern Germany, 1939: mountain gunners moving a 7.5cm Gebirggeschütz 36 with pack animals – both mules and small horses were used. This split-trail howitzer entered service in 1938; it had a maximum range of 10,000 yards, and its 750kg (1,654lb) weight broke down into eight pack-saddle loads, including immediate-use ammunition, for transport.

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movement, and making wireless communication problematic. This was an entirely different sort of war. In 1942 LtGen Lesley McNair, commanding US Army Ground Forces, went so far as to suggest:

> It appears that there is an interrelation between divisions suitable for use in mountain terrain and those suitable for jungle terrain. Both preclude the use of the mass of heavy equipment and transport of our infantry divisions. Thus it seems appropriate to consider both mountain and jungle divisions together, at least to the extent of using the same organisation and equipment for both, so far as appropriate.[2]

Trawsfynydd, Wales, 1942: gunners of the 1st Mountain Artillery Regt training with a 3.7in 'pack howitzer' during Britain's development of specialist mountain units. The crew wear the hooded windproof smock in pale tan cotton fabric, serge mountaineering breeches with long socks and ankle-puttees, and rucksacks (compare with Plate B3). The 3.7in 'screw gun' dated from 1917, when it was the British Army's first split-trail design. It weighed slightly more than the smaller-calibre German gebG 36, but also broke down into five loads for mule transport with three more for 'ready' ammunition. The spoked-rim wheels were later replaced with rubber-tyred wheels for towing by motor vehicles. Despite its relatively modest 6,000-yard maximum range it saw service both in Italy and, in greater numbers, in Burma; it was also the initial equipment of the Airborne artillery. (Imperial War Museum 19494)

Yet, as was true of thick jungle, to dismiss even the coldest or most mountainous terrain as impossible for warfare was a mistake. Given the right training, clothing, and equipment, armies began to solve the three major problems of cold-weather warfare: keeping warm, keeping moving, and preventing malfunctions. Having achieved this, it would be possible to begin using different tactics with confidence, building upon those pioneered in earlier decades by the Scandinavian armies, and by French, German, Austrian and Italian mountain troops.

'MOTTI' TACTICS: FINLAND, 1939–40

The first major outbreak of cold-weather warfare came with the Soviet invasion of Finland on 30 November 1939. The Red Army made multiple thrusts along the borders, all the way from the Leningrad front in the south, to Petsamo on the Arctic Ocean in the north. While the assault on the narrow Karelian Isthmus was temporarily halted against the conventional fortifications of the Mannerheim Line, elsewhere the fighting assumed a more novel character.[3] Russian columns were blocked, encircled, counterattacked, and then destroyed piecemeal, putting them *hors de combat* whole divisions at a time. Crucial to the Finns' initial success in this 1939/40 Winter War were so called *'Motti'* tactics.

Motti is Finnish for a 'cord' of wood secured for cutting, and the textbook Motti action consisted of three phases. In the first, Finnish patrols reconnoitred the enemy and pinned him down within a confined space, often by making use of darkness, ambushes, mines, and demolitions. In the second phase, short, jabbing attacks worked their way into the gaps between the elements of the Red Army columns, breaking them down into isolated

2 See Men-at-Arms 482, *The US 10th Mountain Division in World War II*, for the conceptual development of US light infantry divisions.

3 See Elite 141, *Finland at War 1939–45;* and Fortress 88, *The Mannerheim Line 1920–39*

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fragments. Finally, each pocket was attacked in turn, starting with the weakest, while cold, hunger and isolation began to work on others. US Infantry School commentators would later abbreviate these phases to: reconnaissance and stopping; attacking and cutting; and isolation and annihilation:

> Following the initial reconnaissance, combat patrols attack the enemy from all directions. This creates the illusion that attacking forces are everywhere, and the enemy never knows where to expect the next attack. Maximum use is made of the concealment provided by darkness and the forests. Enemy security posts are avoided. To increase their demoralising effect, patrols hold fire until within close range… Profitable objectives are marching troops, bivouacked units, motor columns, and supply dumps. Guerrilla patrols set off demolitions and plant mines in the rear of the enemy, especially on roads to the rear. Some patrols are given both reconnaissance and combat missions, but the majority have only combat missions. Each patrol carries out more than one mission; after attacking at one point it moves rapidly by skis and attacks another point of the column. Sporadic attacks in company or battalion strength are directed at specific limited objectives. After the objective is destroyed or the enemy is forced to deploy, the attacking force disengages. These activities force the enemy to increase the size of its security forces, and produce an overall effect of uncertainty, fear, and depression.

Finnish female observers in a watchtower pass reports by telephone, winter 1939/40. Their fleece caps, mittens and luxurious-looking fur coats are not a fashion statement: while Finland's climate is warmer than Siberia's, the Lapland winter is still extremely inhospitable. In northern Finland snow begins to fall at the end of August; winter lasts for seven months, and metre-deep snow and temperatures well below -20° C are commonplace. (IWM 52943)

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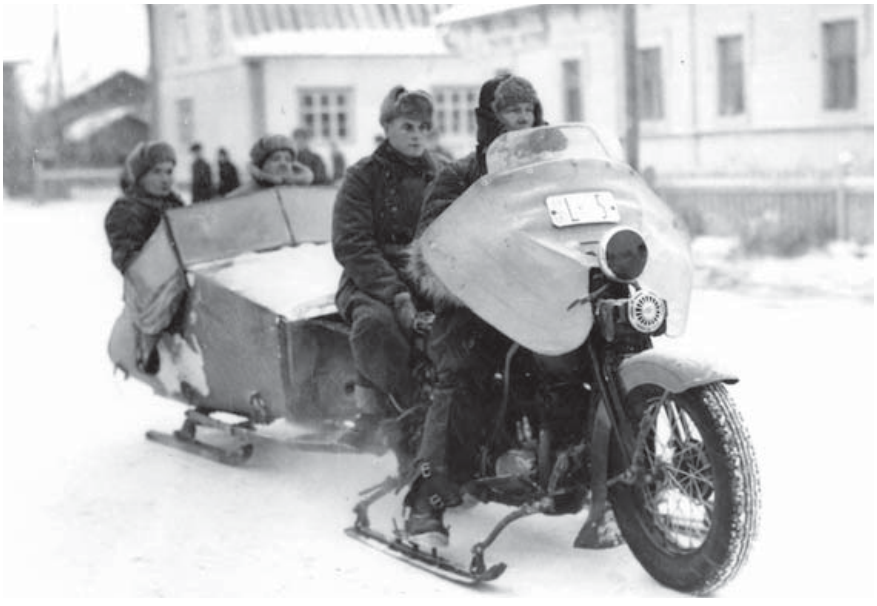

Finnish troops use local transport, January 1940. The motorcycle has been adapted with a large fairing, outrigger skis, and a ski trailer, allowing the movement of four men along otherwise impassable routes.

Once the trap had been created, Finnish units could be marshalled into areas 'outside the radius of enemy land reconnaissance', under cover of night or fog, and now accompanied by their own supply and support arms. Heavier weapons were moved up using sledges or man-hauled boat-like *ackja* that glided over rather than through snow. Guide parties maintained direction and marked trails, as the bulk of the infantry moved at an easy pace to conserve energy for the assault. Where possible, forces were moved to within a few hundred yards of the road they were to cut; the attack was made by surprise, quickly placing forces astride the road before the main body melted back into the surrounding wilderness. The ability of the enemy to react could be further compromised by cutting several roads simultaneously. While the enemy tried to break out he would have to attack the Finns at unfavourable odds, and in the meantime further attacks broke down defenders into smaller portions by flanking attacks. In places where the Soviets succeeded in creating a strong all-round perimeter they were subjected to sniping, night raids and mortar fire. Eventually exhaustion, lack of supplies and casualties finished the work of 'annihilation', although in places the Russians managed to hang on for a considerable time supplied by air drops. In others, such as East Lemetti, the encircled troops ate their way through their regular supplies – followed by their transport horses, down to and including the bones.

On the Kemi river in the north, photojournalist Carl Mydans saw the results of 'isolated and annihilated' columns. On the ice round about lay Russian dead, some of whom had struggled up to their belts in snow. Closer to him were

> Russian Ford trucks with windshields, radiators and bodies bullet-shattered. Bloodstained seats told what had happened to the drivers. But back on the narrow icy road and in the woods was a sight that even the most hardened war reporters have called the most horrible they have ever seen. Trucks and supply sleds stood jamming the road. All faced Finland. Here they had gone into the ditch on either side, thrown or driven there by necessity. Dead Russians lay about like

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RIGHT The Finnish cross-country ski champion Sgt Pekka Niemi and his patrol on operations, January 1940. Before the Winter War, Niemi had competed successfully at distances up to 50km (31 miles) – more than enough to conduct surprise long-range missions against the invading Russians. Niemi was quoted as saying: 'Our troops are well trained and well led. Many of our officers served in the German or Russian armies in the old days. Finland's forests and lakes make it easy for us to block enemy advances. On skis we can glide through the forests to cut them up from the flanks like firewood.'

FAR RIGHT Two of the 725 volunteers of the 'Norwegian Free Corps' in Finland in 1940. Their winter warfare equipment is already of advanced design; it includes two-piece hooded snow-camouflage suits and a white cover for the Bergen-type rucksack. Sweden was Finland's most significant foreign supporter, supplying 77,000 rifles and nearly 200 assorted artillery pieces; in addition, some 8,000 Swedish volunteers arrived before the end of the Winter War.

> fallen leaves. With them were their horses, and a shattered truck filled with black bread, a big pile of old leather shoes, heaps of bologna tied with string and hauled like ropes, helmets, gas masks, packages of rice or red powder for making soup, cases of canned fish, cotton sacks of tobacco, machine-gun clips, shells, ammunition, sleighs, harnesses, arms and legs, pink blood in the snow.

Undeniably effective as such tactics were, it appears to be a myth that they were systematically worked out in advance. According to Capt A. Suvantola of Finnish 13th Div, the term *Motti* was itself coined only after the war began, and had originally been the name of a communications post in the IV Corps area. Major-General Hägglund, hailed as a great proponent of these methods, stressed that only one of the Mottis that he was involved with – the 'Great Motti of Kitilä', in which the Soviet 168th Div was caught – was created intentionally. Finnish pre-war tactics, like those of many nations, were predicated upon a general notion of encirclement, and the Russians, moving forward and unable to deploy from roads, obligingly put their heads into a trap. Some Soviet units remained in precariously advanced situations

A

FINNISH *'MOTTI'* TACTICS, 1939–40

This shows the climax of a Finnish attack against an invading Soviet division during the Winter War; we draw here upon diagrams published in a US Infantry School quarterly of 1949. Initially the Finns allow the enemy to advance along roads, only reconnoitering to determine their strength and direction. Ski patrols in moderate strength are then employed first to harass, and then to pin down Russian elements **(inset 1).** The invaders are obliged to remain in contact with their lines of communication and, being motorized and short of ski equipment, they are trapped on the main roads **(inset 2),** while the Finns can exploit their greater mobility across country. Bunched targets become vulnerable to snipers **(inset 3),** especially when fires are lit at night, or men gather around the field kitchens on which they depend for life-giving warm food. Small teams hit from the flanks of delaying road blocks **(inset 4),** provoking the Russians into costly counterattacks. With the enemy pinned, the Finns assemble units up to regimental strength, out of sight and so positioned that they flank the roads. They then attack in many different places, using terrain and cover of darkness to get close. Having identified weak points, these attacks then cut the enemy columns into ever-smaller portions – the *'motti'* of Finnish slang – which can be isolated and destroyed one by one. Where the Russians are determined to resist miniature sieges develop, as their columns are debilitated by cold and lack of supplies.

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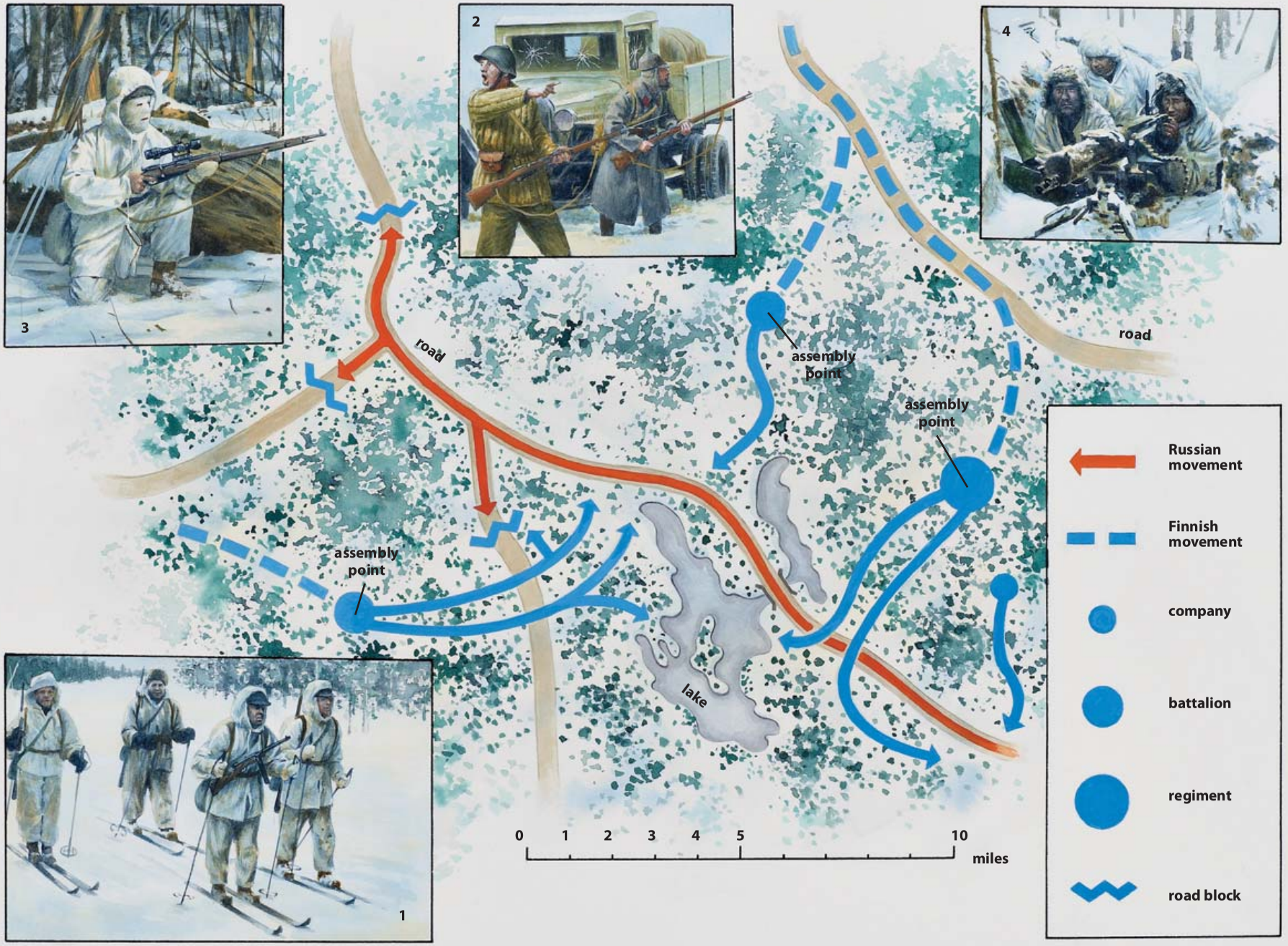

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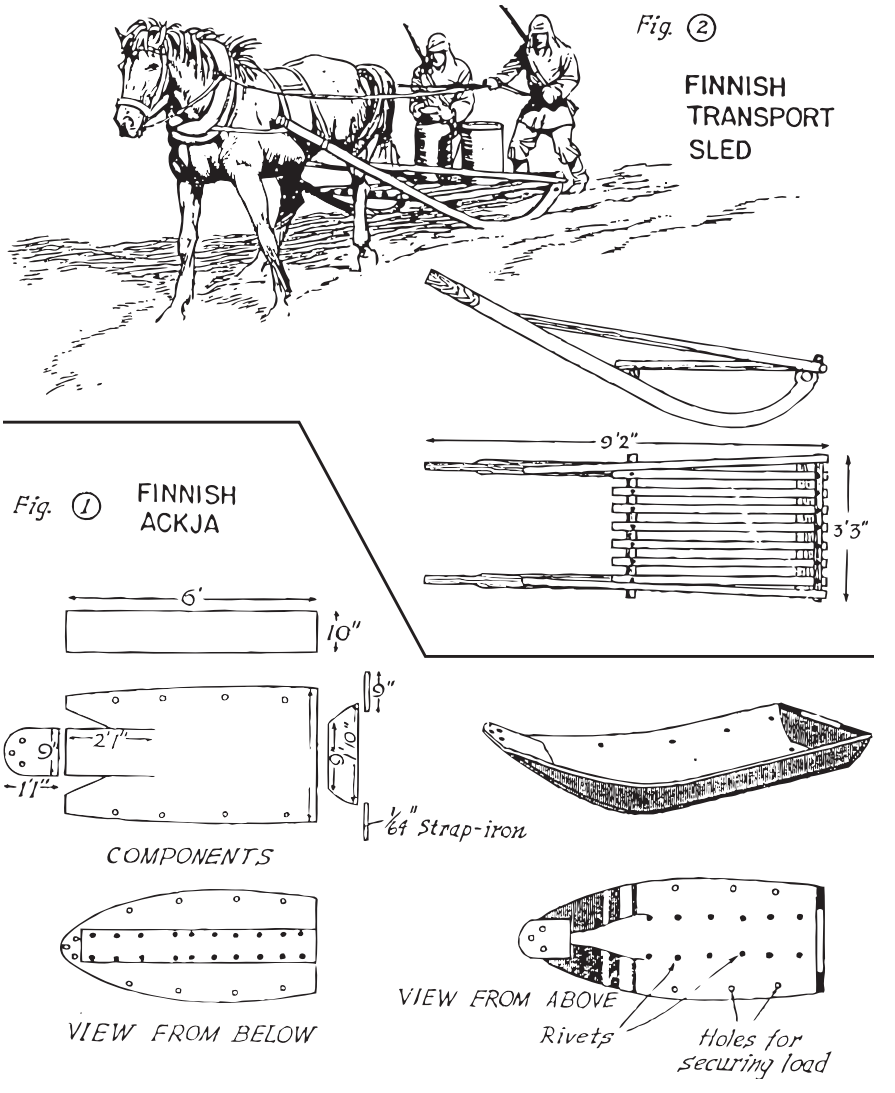

Various models of Finnish transport sleds and *ackja* saw extensive use in both the Russo-Finnish War and the later campaigns on the Eastern Front. These illustrations are from an article on 'Sleds for Winter Warfare' published in the US periodical *Tactical and Technical Trends* (January 1943).

deliberately, believing that relief was imminent, or that breaking out to the rear would be viewed as treachery. Finnish signaller Viljo Kontio was not unique in seeing Russian soldiers withdrawing from apparently impossible positions being 'coldly shot' by their own side.

Development of Motti tactics was therefore the product of a number of factors. One of these was simply the Finns' aggressive *élan*, or *sisu,* when fighting on home territory. By contrast, the Red Army was hamstrung by the purges that had so recently removed a major proportion of the officer corps, whose every movement order now required political approval. There were other reasons – climatic, equipment-related, and accidental – that helped to bring about these disasters, before the overwhelmingly more numerous Soviets finally managed to win the war in mid-March 1940. Highly significant was the manner in which Russian forces were tied to roads, for until the introduction of the Siberian ski brigade the vast majority of the force employed was either infantry or motorized. A single vehicle destroyed in the roadway, or halted by the real or imagined presence of mines and snipers, could lead to a blockage that was the beginnings of catastrophe. Heavy

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Red Army T-26 light tanks captured by the Finns. The Soviets often threw away their technical advantages during the Winter War, allowing their armour to be cut off and trapped on roads. So many T-26s were captured that they later equipped whole Finnish units during the 'Continuation War' of 1941–44.

equipment such as artillery moved by road – as did most supplies, since there was nothing that a Finnish village in winter could be coerced into parting with that would support a Soviet division. The Finns recognized this logistic imperative, and in places enforced a 'scorched earth' policy before the enemy advance.

While the Russians were keen to get armoured forces into action, these were poorly co-ordinated with infantry, lacked modern communications, often faced rivers where the thick ice had been blown, and were difficult to use in deep snow. Initially Soviet armour even lacked snow camouflage, and so became a sitting target for the few guns the Finns possessed. Formal training for Soviet skiers appears to have advanced little since 1917, their manuals showing civilian-style equipment, and such impracticalities as bayonet-charges on skis (all but impossible when one considers that skis work by the reduction of friction, and solid bayonet thrusts depend on good contact between the bayonet-fighter and the ground he stands on).

Many Russians possessed felt boots, heavy coats and other items of winter dress, but the winter of 1939 was extreme by any standards. The Russians were dependent on bulky field kitchens that overburdened roads or were easily lost. They also built large campfires; these gave away their positions from long distances, destroyed their night vision, and silhouetted them as targets for Finnish snipers.

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The Finns, by contrast, regarded cross-country skiing as normal, but appear to have realized that skis were useless fighting platforms. The Finnish ski boots or *pieksu* were quick to detach; wherever possible troops shed their skis before contact and went prone, camouflaged against the snow in white clothing. A first-shot kill against a starkly outlined standing target counted for much, and a few of the Finns were already armed with an effective sub-machine gun in the shape of the Suomi M1931. Lack of artillery was a constant complaint, and much of the ordnance that Finland sought on world markets did not arrive in time; but more would have required cumbersome transport across the frozen wastes, and furthermore the deeper the snow, the less effective was the detonation of shells. Finnish tactical actions were also hugely aided by terrain, the forests and many small lakes tending to force Soviet columns through a series of defiles. Sometimes weapons could be placed to fire across bodies of water from positions that were all but unassailable; sometimes apparently trivial obstacles, like tank traps or a broken bridge, created massive traffic jams. In such circumstances weight of numbers was not necessarily advantageous.

Interestingly, the US, German, Russian and British literature shows that the lessons of the Winter War were widely disseminated; but the extent to which they were effectively digested and implemented over the next five years would vary markedly.

B

BRITISH WINTER & MOUNTAIN EQUIPMENT, 1940–43

Beyond 'watch coats' and woollens, general British preparedness for winter warfare was negligible in 1939. The heavy watch coat, for issue to sentries standing guard in harsh weather – particularly by night – had been commonplace in the British Army since at least the mid-18th century, but it was quite impractical for men who had to move around tactically. Woollen balaclavas, cardigans and other 'comforts' reminiscent of the Crimean War were often obtained privately. Trials of specialist clothing and equipment began immediately following the harsh lessons of the Norwegian campaign, but it was not until 1942–43 that both clothing and techniques were fully developed.

(1) Anti-aircraft sentry, Norwegian Expeditionary Force, 1940

The headgear is a sheepskin winter cap, probably obtained from Royal Navy stores; there was also some issue of heavy white roll-neck naval sweaters. Over his wool serge 'Battledress' this sentry wears a heavy canvas 'Tropal' watch coat; this first model was partially lined with sheepskin and serge, and fastened by means of metal spring clips. In some units there was a partial issue of short lace-up rubber boots obtained from commercial sources, but most British soldiers had only the standard leather 'ammunition boots' to protect their feet from the extreme cold. The sentry wears the ubiquitous gas-mask bag in the 'alert' position, and the rolled anti-gas cape is carried on tapes behind his shoulders. (Based on photographs by Martin Brayley, for article by Brayley & Richard Ingram in *Militaria* magazine No.117, April 1995.)

(2) Officer, Pioneer Corps; Iceland, 1942

Iceland was occupied by Allied forces to deny the Germans this North Atlantic base commanding vital shipping lanes; the initial British garrison was later replaced by US troops. This Pioneer Corps officer, apparently on a fairly relaxed local patrol in summer, perhaps typifies a period when cold-climate dress was largely improvised. He wears standard Battledress and officers' brown boots with 'anklets, web', and a couple of additions. The practical 'cap, comforter' was a closed woollen tube that could be used as a short scarf ('comforter', in the old-fashioned term), or rolled up into a cap; it was a general-issue item, though this particular example was photographed in a magazine called *Knitted Comforts for Service Men*. The unusual reversible fur jacket – collarless, waist length, and closed with wooden buttons and cord loops – is a locally purchased item used in Iceland by F.P.W. Cartwright of Preston; it survives in the Lancashire Museum collections.

(3) Private, 52nd (Mountain) Division; UK, 1943

This trooper of the converted Scottish 52nd (Lowland) Division under training wears the new ski cap with a fold-up ear and neck flap, introduced in 1943; the bottom of the long visor was lined with black to protect against snow blindness. The 'layering' principle for cold-weather clothing was now beginning to be understood, and the lightweight windproof hooded smock in tan colour was introduced in 1942, with drawstrings for the hood and bottom hem, and four large patch pockets. Mountain breeches ending below the knee were also produced, worn with long socks and ankle-puttees, but this man wears Battledress trousers in the same way. The sturdy mountain boots are of brown reversed leather, greased for suppleness, and have steel cleats around the toe and sides of the heavy sole. The capacious 'Bergen' rucksack with external pockets is of canvas mounted on a metal supporting frame with leather straps. This and similar clothing and equipment would see active service with other units in Italy in 1944–45, and by special forces, but in the event the 52nd Div was never deployed to mountain theatres of operations.

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THE WESTERN ALLIES IN NORWAY, 1940

Intervention in Finland planned, January–February 1940

As the brave underdog resisting the Soviet bear, Finland earned considerable international sympathy by its performance in the Winter War. The French formed and began assembling a division-sized expeditionary corps for Finland in mid-February 1940, and Winston Churchill (then the pugnacious First Lord of the Admiralty in Neville Chamberlain's British government) actively championed the notion of sending British forces to Finland's support through Norway. Realization of what this might entail led to a scramble to find suitable troops, and 5th (Special Reserve) Battalion Scots Guards was created, under command of a 'distinguished winter sports expert', LtCol J.S. Coats, Coldstream Guards. However, as the regimental history explained:

> Instead of teaching a trained and disciplined body of soldiers to ski, the War Office chose to recruit its new battalion from already experienced skiers, and with this object in view volunteers had already been called for during January 1940. On February 5th telegrams were dispatched all over the world directing the volunteers to report at Quebec Barracks, Bordon, on the 6th, an order which must have caused some amusement to those who received their telegrams in such places as India and Hong Kong. Meanwhile, an advanced party and skeleton staff … were moved to Bordon to prepare for the arrival of the unknown snowmen.

A Gebirgsjäger manning an MG34 on an anti-aircraft mount; note the snowshoes stowed under the flap of his rucksack. Light AA weapons were of greater significance in snow and mountain conditions, since it was difficult, and sometimes impossible, to get heavy guns into action. The original German caption for this press photo, released in February 1939, states that it was taken during an artillery training exercise by 1. Gebirgs Division in the vicinity of Kreuzalm.

Coats was given just 23 days to assemble, equip and train his battalion, whose friends nicknamed them 'The Snowballers'. Some of the more than 1,500 officers and men who reported were soon rejected as unsuitable, and it was discovered that far too high a proportion of the remainder were commissioned officers. The solution adopted was to offer them the chance of serving in the new ski battalion as temporary 'other ranks' but retaining officers' pay. Numbers were then topped up by taking men direct from civilian life: 'veterans of the Spanish Civil War, soldiers of fortune, undergraduates; in fact any man who could ski with a modicum of competence … aged more than 20 and less than 40.' Several of the volunteers had experience of the Arctic or Himalayas, and medical officer E.H.L. Wigram had been on the 1936 Everest expedition. The men were sorted into four ski companies, and a fifth was drawn from 1st Bn Scots Guards to act as general dogsbodies, freeing the skiers from general duties.

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The equipment situation was dire: there were no suitable radios, no Bren guns were allotted, and some of the new recruits had never fired a service rifle. Nevertheless, 5th (Special Reserve) was now packed off to Chamonix in France for training – a fact quickly noted by the enemy. Here they were lent Chasseurs Alpins ski instructors, and taught sledge-hauling as well as skiing. On return to the UK it was discovered that the unit was no longer required, and it was promptly dispersed, never to be reassembled. The historian of the Scots Guards considered this fortunate, as 'it cannot have been judged wise to have concentrated in one unit so many leaders and potential leaders. It was fortunate indeed that these men were not flung away in an altruistic and ill prepared side show'.

Norway, April–June 1940

Within weeks of this episode, on 9 April 1940 Germany commenced the invasion of Denmark and Norway; the former was quickly overrun, but the British government responded with a counter-invasion of Norway. The first troops sailed on 11 April, for Harstad in the Lofoten Islands opposite Narvik in northern Norway. The hurried preparations led to confusion and errors, which persisted during operations by this and two other British forces that landed further south at Namsos (with French troops) and at Andalsnes.

It was another Scots Guards battalion, the 1st, who were first ashore in Norway, receiving their issue of 'Arctic' clothing on board the Polish transport *Batory* during the voyage. This included 'quilted sleeping bags, capok [sic] greatcoats, sheepskin jackets, snowboots and white fur caps'. On unloading at Harstad on 15 April they discovered that communications were poor, the only mechanical transport available was bicycles, and the enemy already commanded the air. It was reckoned that though 400 pairs of skis

German Gebirgsjäger NCOs on board ship *en route* for Norway, wearing various different types of life jacket. The largely Austrian 2. & 3. Gebirgs Divisionen, with their skills honed in the Polish campaign, were the cutting edge in the invasion of Norway. While Luftwaffe air cover was a major factor, the Western expeditionary forces were in any case outclassed by the equipment and preparedness of these specialists.

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were to hand only three men could use them properly. The only way to move the battalion was around the coast on small boats. Orders were issued for an attack on the German troops in Narvik, but this was promptly abandoned as impractical, partly due to the loss of civilian life bombardment might cause.

Attempts to hold Mo to forestall the enemy proved almost equally fruitless. Attacked through woodland at twilight, the Scots Guards discovered that 'all the advantages lay with the enemy, whose automatics were superior to rifles in close fighting amongst trees, and who could vary their positions of attack at will, causing the defenders to leave their positions to meet each new threat'. The battalion eventually retired as part of the retreat to Bodo, abandoning much of its equipment due to lack of any means to move it. By 25 May the battalion's war diary was frank in its assessment: 'The men were utterly exhausted and a certain demoralisation had set in, in consequence of fatigue, loss of kit, a succession of rearguard actions, and continuous menace from the air, which invariably disclosed every position to the enemy and enabled him, without interference, to harass the battalion'.

Confusion, and shortage of air cover, of anti-aircraft guns, artillery, and vehicles was typical of the British experience, and for some the Norway 'campaign' was incredibly short. The 1st Bn King's Own Yorkshire Light infantry, for example, completed unloading at Aandelsnes in the early hours of 24 April 1940; it was back aboard ship on the night of 1 May, and sailed home the following day.

Notably, British personal equipment was poorly adapted to combat in such conditions. Camouflaged snow suits existed, and the serge battledress was supplemented with gloves, balaclava helmets, woollen jumpers, and sometimes rubber boots. The warmly-lined 'Tropal' coat or 'Coat, Sheepskin' was also widely issued; this was a full length, single-breasted, deep-collared garment in heavy canvas, fastening up the front with metal clips easier to manipulate with cold, gloved hands than buttons. The crucial point, however, was that the 'Coat, Sheepskin' and its successor, the closely related 'Coat, Kapok Lined', were never

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BASIC MOUNTAIN TACTICS; NORWAY, 1940

(1) Norwegian Army infantryman

This tunic uniform, while old-fashioned in appearance, is warm and comfortable, and has practical features drawn from everyday experience of outdoor life in Norway's terrain and climate. The obvious examples are the visored, flapped mountain cap, and the long gaiters with substantial strapped 'spats' to keep snow out of the boots. White camouflage clothing was available for snow conditions. The leather belt and pouch equipment worn by many European armies of this period was needlessly expensive, and limited in its capacity and versatility, but the rucksack is superior to the packs worn by most other armies. The rifle is still the old side-loading bolt-action 6.5mm Krag-Jorgensen dating from 1894.

(2) Ambush defence on mountain road

This illustration is based on a technique used against the Germans in 1940, as explained in displays in the Forvarsmuseet in Oslo, but it was widely applicable. It could be set up in advance, or employed by a force retreating up a road or track in face of an attacker. The defenders (**blue**) secure – or simply stop upon – the road, taking advantage of the hairpin bends required to negotiate a steep slope. Waiting until the enemy (**red**) are parallel to and below them, and exposed to the flank, the defenders open fire when the head of the enemy column reaches the optimum position (**red line**). The attackers will frequently be forced to retreat immediately; otherwise they will have to continue along the track under flanking fire, or leave it and attempt to climb or descend the rough slopes.

(3) Norwegian machine-gun crew

While Norway's infantry did have 6.5mm M1914 and M1918 models of the Danish-designed Madsen light machine gun, they were poorly supplied with heavier weapons. This water-cooled M29 machine gun was similar to the Colt M28B – basically, the 1917 Browning design, fed by 250-round fabric belts. It was used with both ground and anti-aircraft mounts.

(4) Ascending platoon attack

This illustration is based upon the technique as explained in German literature but, again, was widely applicable. In the first phase the enemy position (**red**) is scouted, preferably under cover of poor light or bad weather. Next, a light machine gun team is pushed up into a suitable position, and opens fire (**blue**). The remainder of the platoon now advance from one piece of dead ground to the next, under the overhead covering fire of the LMG. Where the terrain makes this impossible, covering fire is delivered from a flank, or through a lane left open by the attacking troops.

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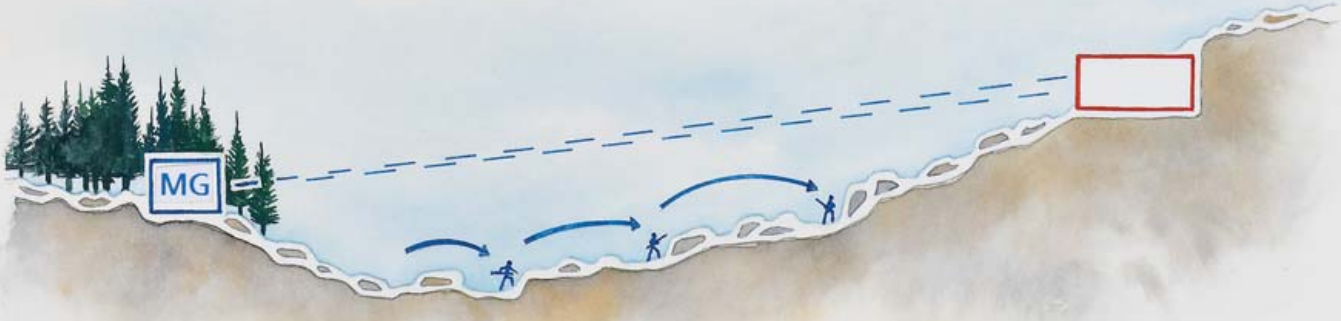

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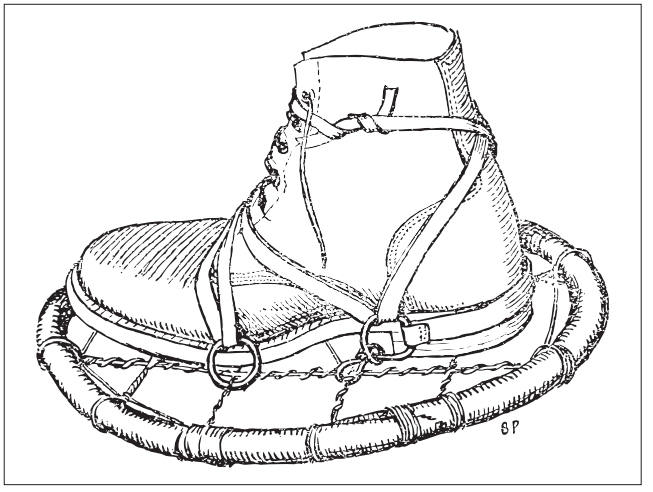

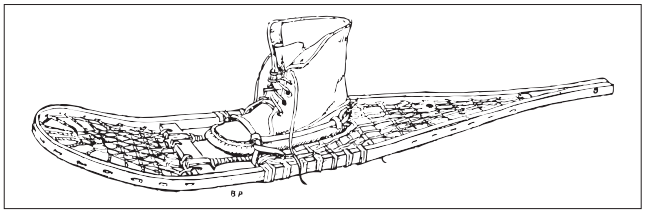

ABOVE Snowshoe with 'trudge' binding, derived from a type used by Norwegian farmers, as illustrated in the British *Handbook of Clothing and Equipment Required in Cold Climates* (1941). It was suitable for troops with or without previous experience, and, having a wire mesh base, could be used with ordinary army boots. All-wood snowshoes were only durable if used with a soft-soled boot.

BELOW From the same British manual, produced in response to the near-fiasco in Norway, this shows a 'pickerel' snowshoe. Derived from a Native American design, this type was intended for swift movement on light, drifting snow. Note that it is shown fitted to a rubber boot.

intended as combat gear. They were based upon a very similar World War I garment used mainly by Army Service Corps drivers and others who were exposed to cold while in essentially static roles. Like the massive fur coats worn 'unofficially' by some German and Russian infantry, the sheepskin was regarded as a 'guard coat'. As Gen Caton de Wiart explained, 'the British troops had been issued with fur coats, special boots and socks to compete with the cold, but if they wore all these things they were scarcely able to move at all, and looked like paralysed bears'.

The French, proficient exponents of mountain warfare in World War I, were better prepared in that their first contingent, landed at Namsos on 19 April, included three battalions of Chasseurs Alpins with trucks. However, bad weather and German air attacks destroyed part of the French equipment and delayed the arrival of artillery, mules, radios and other stores.[4] In Norway the Allies were outnumbered, out-planned and under-trained, and the simultaneous German onslaught in the West from 10 May prevented any remedy. As the evacuation from Dunkirk came to a conclusion early in June, evacuation from Norway was also underway. That French mountain forces might have done better in Norway was soon demonstrated in the Alpes Maritimes, where Italian forces received a rude, if brief, shock when confronted by the Armée des Alpes in June 1940. In a two-week battle Mussolini's Alpini suffered a number of reverses, as at Mont-Cenis, and when attempting the assault of French fortified positions.

The British and US response

If the lessons of Finland and Norway should have, and eventually did provoke a revolution in the way armies fought in winter, reactions around the world were uneven in both urgency and scope. For Britain the miniature disaster of Norway acted as a developmental spur. Procurement of new equipment began, followed by the publication in 1941 of the important manual *Handbook of Clothing and Equipment Required in Cold Climates*. In May 1942 an entire Scottish division, 52nd (Lowland), began retraining in the mountain warfare role. Key models for British advances were Norwegian, Polar, and experience in the mountains of the Indian frontier. A Commando Mountain & Snow Warfare Training Camp opened at Braemar, Scotland, in December 1942, and began running six-week courses

4 The only French infantry to see combat, at Narvik from 27 April, were the 9 bns of Gen Béthouart's 1e Division Légère de Chasseurs (Chasseurs Alpins of 27e DBCA; the Foreign Legion's 13e DBLE; and Gen Szusko's Free Polish 2e & 14e DBCP). The Chasseurs Alpins of 5e DBCA, landed at Namsos, were evacuated without seeing action. The Chasseurs Alpins had mountain anoraks, boots and gaiters; the légionnaires and Poles received an improvised mixture of armoured-car jackets and short sheepskin coats, but rucksacks and snowshoes were generally available.

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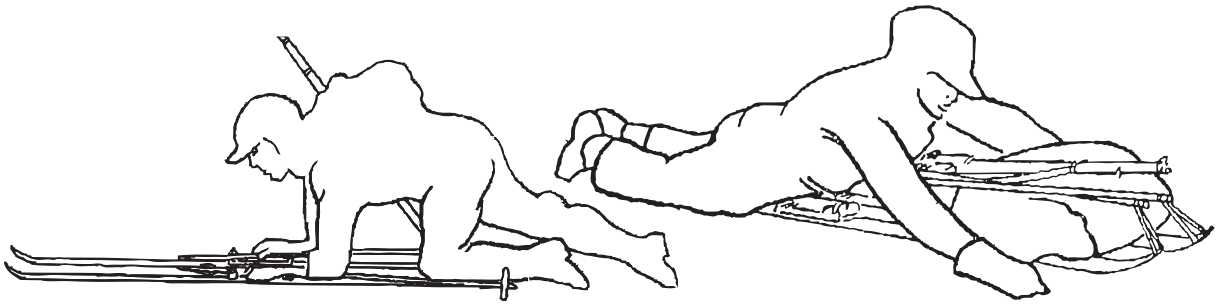

Two recommendations for tactical movement, from the 1943 British manual *Operations in Snow*.

LEFT The 'bear walk', seen in use by Finnish troops, allowed a close approach with minimum exposure. The skis are removed and placed to the front, parallel and slightly apart. With hands grasping the toe straps and forearms resting on the skis, the soldier pushes himself forwards with his feet, keeping as low as possible; this worked best in deep snow or on an uphill slope.

RIGHT The crawl: 'The rucksack is placed on the skis near the tips, and the ski sticks are placed through the toe straps, baskets to the rear and on top of the rucksack. The wrist straps may be used to secure the sticks to the skis. The skier then lies on his stomach on the improvised sledge and pulls himself forward with his hands. The rifle rests on the rucksack with the butt on one of the ski bindings.'

in living, skiing, climbing and fighting in cold conditions. (The following year its commandant was Maj John Hunt, the future leader of the 1953 Mt Everest expedition.) As of 1943, the *War Clothing Regulations* carried an appendix for troops operating in cold climates. Significantly, this omitted the heavy greatcoat, but included the serge battledress, a smock and trousers of windproof material, string vest, heavy wool jersey, peaked cap with ear flaps, cold-weather boots, and 'Boots, Ski, March' doubling as both ski and mountain footwear.

In the US, Gen George C. Marshall announced that the Finnish campaign would be studied, and a testing and training programme was instigated in the winter of 1940–41. The 87th Mountain Infantry Bn was activated in December 1941, and the War Plans Division noted that as a balanced force was required 'for any type of operations', at least a division trained in mountain warfare should be created. The 10th Light Division (Alpine) was activated at Camp Hale in 1943, but would not be shipped to Europe until winter 1944/45. However, the regiment-sized US-Canadian First Special Service Force, under LtCol Robert T. Frederick, was created and trained for special tasks including mountain operations, and was in action in Italy by December 1943.[5]

THE SOVIET TACTICAL RESPONSE: *COMBAT IN WINTER* (1941)

Perhaps unsurprisingly, it was the Soviets, shocked and humiliated by their long-delayed and Pyrrhic victory in the Winter War, who were quickest to revise their military thinking. As early as April 1940 the Supreme Military Soviet began to pick apart a conflict that had cost Russia perhaps 300,000 casualties. As well as undoing a number of political innovations and reintroducing some of the rank structures and disciplines so recently dispensed with, clothing, equipment and training also came under consideration. More than one historian has suggested that it was this period of improvement that allowed Russia's narrow margin of survival just over a year later. Practically, the Winter War also opened the way to annexations that put some spatial padding between Moscow, Leningrad, and potential enemies. This new buffer was the Baltic States, absorbed into the Soviet Union in August 1940, along with enough former Finnish territory – as one wag put it – 'to bury our casualties'.

5 See MAA 482, *The US 10th Mountain Division in World War II*, and ELI 145, *First Special Service Force 1942–44*.

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Soviet Cossack cavalrymen take cover behind their horses in the snow, 1941. While this gave a low position, and prevented the horse from bolting, it was largely ineffective on the winter battlefield. There was some use of snow-camouflage 'horse cloaks', but usually the dark bulk of horse and rider showed up starkly. Protection for the rider was minimal, since at close ranges rifle bullets could penetrate 3ft of oak – or a similar thickness of horseflesh. Traditionally the first care of cavalrymen in dismounted action was to protect their mounts by sending them to the rear with horse-holders; if the horse was hit, the rider was left stranded on foot in the snow.

A Red Army sapper searching for mines in snow, with the detector coil attached directly to his rifle; such electronic equipment was rare early in the war. While snow made mines and boobytraps much harder to locate, their performance was unpredictable: freezing might render the igniter mechanism inoperative, and snow muffled their effectiveness.

The new Soviet doctrine on cold weather campaigning, codified as *Regulations for Combat in Winter*, was published as Defence Order 109 in March 1941. Arranged as a series of short thematic paragraphs, this manual was both tactical and practical, in the sense that it described equipment and gave hints on survival. The sum of many details were considered when commanding troops in winter. It recognized that, with the exception of ski patrols, any activity was expected to take two or three times longer than in summer. Command decisions had to be informed by weather, daylight, intelligence through 'reconnaissance and the interrogation of local inhabitants', types of terrain and requirement for roads, and calculation of effectiveness of equipment in cold. A key observation was that troops well trained in winter operations enjoyed an advantage over an enemy who was not so well prepared, and therefore likely to be debilitated.

Movement

Particular snow conditions would govern what one could expect to accomplish, and how it was to be achieved. At up to 30cm (12in) depth it was assumed that operations were essentially similar to those conducted in summer, albeit with recognition of likely delays and concessions to camouflage. Night moves were advantageous, due both to the shortness of winter days and the generally increased range of visibility in snowy conditions. Conversely, it was expected that wheeled transport would be limited to roads, and that fog could dramatically shorten visibility.

When snow depth exceeded 30cm much depended on whether it had formed a crust capable of bearing the weight of a skier. With no hard crust, infantry progress slowed to 2, or at most 3kph (1.2–1.8mph), and rapidly became exhausting. On the other hand, a hard crust and the right terrain allowed trained ski troops to accelerate, covering perhaps 40km (25 miles) in a day if they went lightly equipped and were not tied to supply convoys. In good weather troops could dispense with packs and greatcoats, towing light support weapons on *volokushas* or 'snow boats'.

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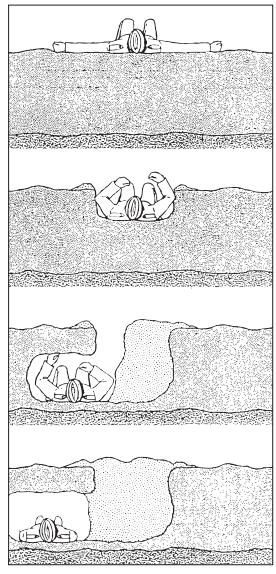
Digging-in

Breaking up frozen ground was extremely difficult with ordinary entrenching tools, and even with pickaxes and engineer shovels available it might take a man more than three hours to excavate a cubic metre. However, if digging was not urgent and was carried out in a well camouflaged location well away from the enemy, fires could be lit to thaw frozen ground first. Where possible, field works were dug in accordance with the usual regulations, but they could also be constructed on the surface from snow and ice, provided that the thickness was varied to suit the material. Loose snow was not effective at stopping small-arms fire and splinters, so had to be formed into banks at least 3m (9.8ft) thick. Well packed snow could be reduced to 2m thickness, and ice 1.5m (6.5 and 4.9 feet). Timber or frozen earth were slightly more resilient, but still needed to be over 90cm (3ft) thick. All surface works required camouflage, usually in the form of heaped snow front and rear. Additionally, as *Combat in Winter* explained:

> To protect personnel from wind and snowdrifts the trench must be covered by a row of posts covered with brush, thatch and snow. For warming rested personnel, construct 'dirt huts' or dugouts below ground. Heat these with portable stoves. These dirt shelters or underground dugouts are to be connected by communication trenches. Provide simple signs for troop guidance. Before constructing shelters or dugouts, troop sections should first prepare communication trenches or three- to four-man resting and warming trenches. These are dug deeper, covered with posts and piled with snow. Groundsheets and thatch are to be used to camouflage the entrance.



This illustration is from an American translated edition of the German 1942 *Pocketbook for Winter Warfare,* but the principle was equally applicable in the Red Army. The simplest snow hole, to get a man out of sight and into some sort of shelter, could be made by rolling back and forth in deep snow, digging himself in with hands and feet until he was about half a metre (16in) down. He then dug sideways, to disappear entirely.

Concealment

'Snow suits and snow shirts', largely unavailable in the early stages of the Winter War, were now regarded as *de rigueur*; white 'cloaks' were even recommended for 'dark coloured horses'. Trucks and other equipment were to be painted in white camouflage patterns or covered with awnings and nets, supplemented with white canvas or cloth covered in snow. Trenches were best covered with nets or branches, over which more snow was scattered. All troops were to be wary that horse paddocks, tracks, and smoke from fires were obvious give-aways. Good measures to avoid discovery included quartering troops in forests, brush, ravines and villages, and maintaining only low-burning fires, covering evidence of soot with fresh snow. Light-coloured smoke could also be produced in quantity as a form of concealment.

Anti-tank defence

Though most tanks could still operate in snow up to about 50cm (20in) deep, at over 25cm the effectiveness of mines became questionable, and for anti-tank mines especially it was recommended that these should be laid on wooden baseboards or attached to posts to avoid failure to detonate, and then carefully camouflaged with snow. In frozen conditions AT defences might be supplemented by snow walls, heaped laboriously by hand or road-grading machines, by frozen slopes on river and lake banks, and by holes blown in river and lake ice. As a rule of thumb, it was expected that ice less than 15cm (6in) thick could be hammered away by hand, any greater thickness being blasted. Half-metre (16in) thick ice required about 100g (3.5oz) of explosive per square metre area (10.7sqft) to break it up effectively. In snow deeper

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than 50cm, AT guns in concealed positions forming intersecting fields of fire were even more than usually effective, as the thickest drifts formed impenetrable areas. Though guns could be left in fixed positions, ski sled frames gave additional mobility. In winter troops forming anti-tank defence lines were advised to operate a system of warning signals, using dark-coloured or red flares in good visibility and sound signals in poor conditions.

Patrolling

The relief of posts and the maintenance of patrols was even more crucial than in normal conditions. While deep-penetration ski patrols probed the enemy, units also mounted missions for reconnaissance and early warning. These might involve ski troops, cavalry and even armour. How far detachments should roam depended on circumstance, but *Combat in Winter* recommended anything up to 20km (12.5 miles) from battalion-sized units, and half that distance from companies, with even platoons sending patrols out for a couple of kilometres. How long patrols stayed out varied, but was not likely to exceed 24 hours. It was suggested that reconnaissance units be assigned predetermined sectors – up to 5km wide for the larger units – thus improving coverage and limiting chances of 'friendly fire' encounters.

Ski patrols planning routes took stakes with them, marking out paths as they went. Patrols themselves did not usually remain bunched, but sent scouts out for a few hundred yards in different directions, and spread out along trails with intervals of 25–50 yards between individuals according to conditions. The use of horses in reconnaissance was in part determined by snow depth, but cavalry were to be accompanied by skiers who could leave roads and search out otherwise inaccessible vantage points. Where skiers and cavalry worked in tandem, mounted troops provided short rests for the skiers by towing them.

This Waffen-SS soldier, bringing in one of the countless Red Army prisoners taken during the Wehrmacht's victorious drives deep into the USSR, no doubt shares his Führer's confidence at this point. However, the autumn is drawing on; his protection against the chill seems to be limited to a scarf, while his captive wears a warmly quilted *telogreika* jacket and trousers.

Route preparation

Crucial to the movement of larger bodies was the establishment of 'column routes' by engineers, supplemented by the efforts of all arms. While the specialists concentrated on the use of dedicated equipment to build bridges, landing strips and heated shelters, other troops were to work on entrenchments, obstacles and snow clearance. Once a suitable route was planned, it could be established with snow-ploughs (purpose-made or improvised), and the running of empty sleds followed by progressively heavier burdens. Wherever possible adjacent routes were created for sleds and tracked vehicles, following the most advantageous ground for each and avoiding the creation of frozen ruts that impeded movement. Similarly, infantry and skiers were best kept off the main winter convoy roads. This need could be turned to advantage when skiers formed outlying patrols parallel to the axis of advance. In rear areas 'winter roads' were left to harden; the ice was then graded as if it were gravel or hardcore, and sectors were allotted for different units to maintain.

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The attack

A number of lessons were consolidated in *Combat in Winter*. The first was the advantage to be had from preparation during the long winter nights, unseen by enemy aviation. Artillery was to be arranged so as to support the infantry assault 'over the entire depth of the enemy's combat formation', and armour, viable in shallow snow or on well developed road networks, was to be used only 'on short deployments' during advances over deep snow. Reconnaissance was more vital than ever; any poor camouflage discipline on the enemy's part could be exploited by aerial missions, while ground detachments forced their way into enemy positions through gaps. Advanced guards were to be furnished with skiers, engineers, and mortars drawn on 'snow-boats'. Where practical, advanced guards made sweeping enveloping movements, attempting, in co-operation with frontal attacks, to outflank and destroy the enemy. The 'main force columns' were themselves to advance 'by bounds', deploying advance skiers, particularly on routes parallel to the roads in order to detect and parry counterattacks from the front and flanks. Some artillery was disposed for 'direct suppressive fire' along the routes of march; other batteries would seek out the telltale smoke rising from enemy 'warming areas'.

Red Army 'tank riders' wearing two-piece snow camouflage uniforms over padded clothing and felt boots. The Panzer officer Gen Erhard Rauss recalled that in 1941/42 the Germans were 'amazed' at how well the Siberian infantry were clothed for winter.

Though ski patrols encircling open flanks were of 'decisive significance', main forces might be called upon to make a breakthrough if the enemy succeeded in creating a continuous defensive front. In assaulting prepared defences a key reconnaissance tool was the all-arms 'scout troop'. This was to 'determine the type of the defensive sectors, the pockets of resistance, any winter barricades (ice holes, snow walls, icy spots); and to estimate the trafficability of the terrain to the front for infantry without skis, tanks, and accompanying artillery, and the approach routes for skiers and sectors that are heavily covered in snow'.

For speedy exploitation the main body included detachments for creation of winter roads, and took screened approaches up to a determined 'departure area'. In considering timetables, factors to be borne in mind were that in cold weather forces were not to be left waiting long in departure areas; the delaying effects of mines or obstacles; and the necessity of keeping supporting tanks in contact. Ideally, departure areas were to be reached just before an assault at daybreak. Where the snow was shallow or the terrain otherwise unsuitable assault troops dispensed with skis; a few trained men were detailed to collect them up and bind them together, perhaps dragging them with tow belts up to the point where they would be needed again.

During main attacks ski patrols contributed by penetrating the enemy rear, capturing villages, securing roads and generally harassing the defence. Key goals included separating the enemy from his artillery, pinning down

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larger units, and encircling and destroying small detachments. Where strongpoints were encountered ski patrols attacked their flanks and rear, while reserves of skiers and tanks from main bodies attacked between them, making for rear areas, artillery lines and other vulnerable targets. Surprise attacks at night or during snowstorms might prove successful, but these had to be carefully planned, with troops adhering to unit boundaries lest the attackers become more confused than the defenders. Composition of formations was suited to the task in hand, but in all cases ski units were expected to be mobile and 'able to operate for several days away from friendly units', being equipped with warm clothing and 'light automatics', with each individual carrying his own ammunition supply.

Ski units of company or battalion size could move in open columns four abreast at 6m (20ft) intervals, but it was expected that when moving 'a ski unit will increase its spacing by four to five times over normal distance'. On the approach march skiers were advised to maintain continuous reconnaissance, to favour cross-country movement, and to avoid contacts before reaching the planned target except where small groups could be destroyed. If large bodies were encountered the ski patrol was to break off and seek cover. Where attack was required it was launched during snowfall or other poor visibility, or by means of ambush and surprise. The result of combat depended on the 'initiative, self reliance, resolution and boldness' of each leader and his men. When acting in inhabited areas behind enemy lines patrols were to have no compunction in cutting communications, taking hostages, prohibiting the movement of civilians, or 'interrogating closely' everybody in the vicinity. Patrols were cautioned against letting casualties fall into enemy hands; the wounded were to be evacuated by sled, or in extreme cases lashed to frames made of skis and dragged.

D

MOUNTAIN DEFENCE, 1940–45

The illustration is based upon directions given in the British 1943 manual *Mountain Warfare,* but the essential principles had been developed during World War I and were widely applied; similar instructions were to be found in the German literature from the late 1930s onwards. Here we show them being followed by Italian *Alpini* troops of the *Corpo Spedzione Italiane in Russia.* The CSIR included three Alpine divisions: the 2nd 'Tridentina', 3rd 'Julia' and 4th 'Cuneense', each with two regiments of mountain infantry and one of mountain artillery. The defenders occupy mountain positions to deny routes and passes to the enemy, giving secure observation and fire over the surrounding area. The forward slopes are occupied only by forward observers **(FO)**, snipers, machine-gun squads **(MG)** and small reconnaissance patrols. The machine guns **(inset 1 – 8mm Fiat-Revelli M35)** are positioned to give frontal fire into ravines and defiles, and across fronts to enfilade the enemy; they are either dug in, or otherwise set up to avoid plunging fire. The bulk of the defenders – here, a battalion and a battery – are positioned under cover on reverse slopes, ready to counterattack or reinforce the crest and forward positions. Mortars are placed to bring plunging fire in front of, or on, the forward positions. Supporting artillery **(inset 2 – 75/18 M34 mountain howitzer)** ranges further over the crest from the main reserve areas, to bring fire onto enemy transport nodes and routes, possible jumping-off positions previously identified by reconnaissance patrols **(inset 4),** and targets of opportunity. Rear positions are linked by convenient or improved roads for resupply **(blue arrow),** enabling swift movement of men and materials.

(Inset 3) Sergeant-major of Alpini

While snow-camouflage suits and white canvas webbing equipment were issued to Italy's single ski battalion in Russia (the Battaglione Sciatori 'Monte Cervino'), the mountain infantry wore basically standard-issue uniform. The only visible differences here are the breeches, two pairs of long socks and mountain boots, and the greatcoat shortened for easier movement. The proud mark of the Alpini was the crow's feather in the headgear, which was even attached to the steel helmet; its mounting boss was coloured red, white or green for the three battalions of each regiment. These troops were also deployed to France and the Balkans; in both Yugoslavia and later in Russia they suffered catastrophic casualties in winter battles.

(Inset 5) Red Army scout, 1942

By contrast, this sub-machinegunner is splendidly equipped with specialist clothing. The lessons of the Winter War had been thoroughly learned, and troops transferred westwards from the Siberian front facing the inactive Japanese in Manchuria were particularly well acclimatized. Over a quilted winter jacket and trousers, a sheepskin cap and substantial *valenki* felt boots, he wears a thin, loose, white snow-camouflage suit. Apart from a gas-mask bag used as an all-purpose haversack (which actually helps break up his outline when he is among trees), all his equipment is worn under the snow suit.

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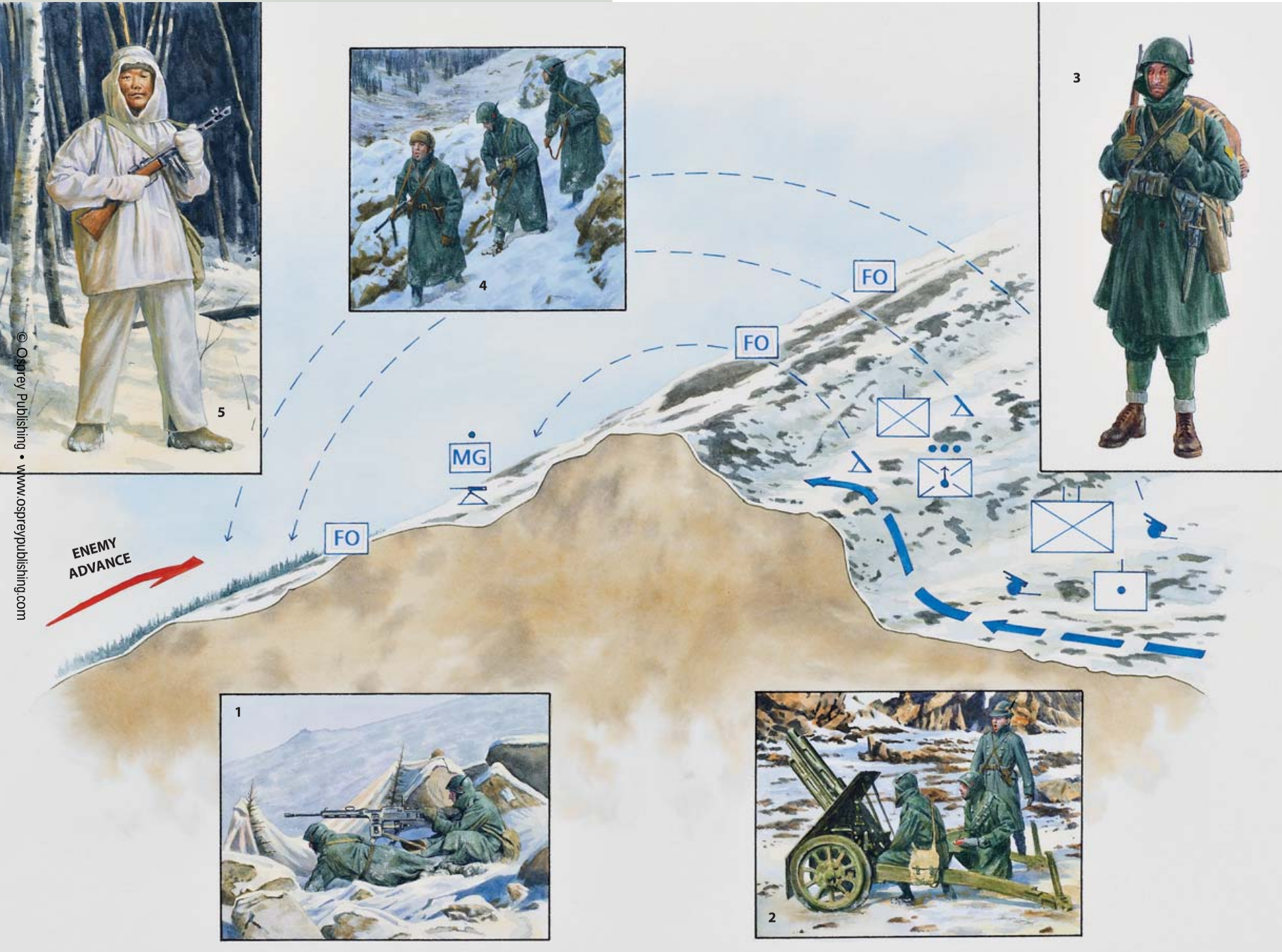

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Soviet official photograph showing a Siberian AT section, clad in sheepskins and fur mittens, waiting in ambush at a fork in a road on the Leningrad front. The single-shot 14.5mm PTRD anti-tank rifle, introduced in 1941, was considerably lighter than the Finnish Lahti model of 1939, which was fitted with short plywood skis. With armour penetration of about 25mm at 500 yards it was soon obsolescent, but it remained in service throughout the war.

The defence

On defence, *Combat in Winter* concluded that though most normal considerations still held there were many additional precautions to be taken. These applied mainly to questions of mobility and warming, as cold weather was likely to debilitate defenders and make it difficult for them to be reinforced and resupplied. Perimeters were to be selected by officers experienced in winter combat who chose lines obscured by terrain, difficult for the enemy to access and denying them the shelter of villages and woods. On the approaches the ice on frozen rivers or lakes could be broken up and mines could be planted, perhaps covered by ski troops or AT weapons on sleds. Dummy trenches confused and diluted enemy attacks and bombardments.

Active defences might include maintaining mobile armoured and anti-tank reserves, or temporary forward artillery fire positions into which guns could be moved for short, surprise bombardments. Focusing artillery or air strikes on known roads or other transport nodes was useful, particularly where this forced the enemy off easy paths and into difficult going. Enemy shelters and warming points might also be destroyed. Security patrols, sometimes as small as a squad or platoon, formed the cement of the defence, often using ski trails to cover gaps and liaise with isolated posts. Where it was not possible to create a continuous front patrols might need to cover considerable tracts of open space, reporting information that enabled the planning of pre-prepared counterattacks through such areas. In defensive action ski patrols sought to form an interlocking zone of automatic fire, and deploy sharpshooters to target enemy individuals and small groups. Ammunition should be distributed economically, but it was wise to keep a main body as a 'shock group'. Behind the front line the maintenance of the winter road network was crucial, since this would enable the defenders to rush reserves in quickly before the opposition had time to establish their own communications.

* * *

While the reforms outlined in *Combat in Winter* had impact, they clearly could not create a crack winter-fighting army overnight, and the Red Army's massive losses in the summer of 1941 made dissemination of information and equipment patchy. In winter 1941/42 troops of both sides became exhausted when movements outran supplies, and they were tempted to seize unimportant villages if only to find cover. Soviet Mountain Rifle units did not prove a match for their opposite numbers. According to the Germans, the Soviet 20th Mtn Rifle Div encountered in the Caucasus in 1942 differed from other divisions mainly in terms of the number of mules and horses with which it was equipped, but lacked adequate training. Sometimes the Soviets were reduced to measures even more desperate than those of the foe: clearing minefields by marching penal units through them, or repeated 'human wave'

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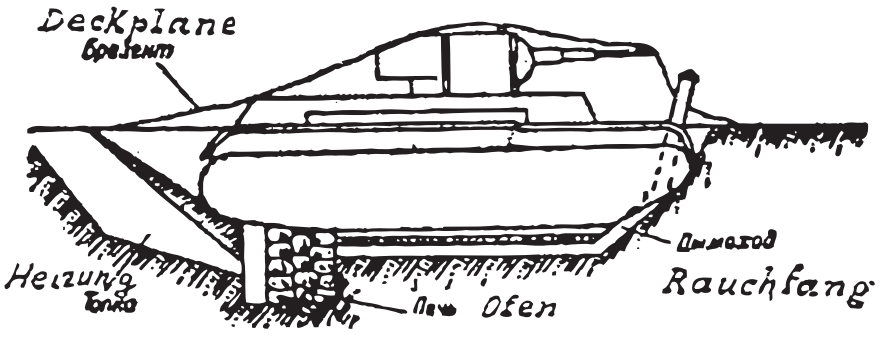

German-annotated diagram copied from the Soviet *Regulations for Combat in Winter*, showing method of emplacing tanks and keeping them free from ice. A pit is dug deep enough to give 'hull down' protection, leaving the turret above ground level. At one end a ramp allows the tank to drive in and out; underneath the hull an improvised oven *('Ofen')* warms the engine compartment, its fumes passing along a pipe and up a chimney. A white cover tarpaulin *('Deckplane')* makes the position all but invisible from any distance.

attacks. On the Volkhov front 2nd Shock Army's snow-clearance methods were brutal:

> They moved only at night; during the day they took cover in the forest. The way forward is not easy. In order to beat a path through the deep snow they had to draw up columns in ranks of 15. The first rank went forward, trampling the snow, which in places came up to their waists. After ten minutes the front rank was withdrawn and took up their position at the rear of the column. The difficulty of movement was increased because from time to time they would come across half frozen patches of bog and streams covered with a thin layer of ice. Their boots were wet through and freezing. There was no way they could be dried out, since it was forbidden to light fires when they rested. Their horses were at the end of their strength. Their fuel ran out and their vehicles came to a halt. They had to carry their supplies of ammunition, equipment and food on their own backs.

Nor was skiing easily taught to a mass army out of season. Early actions often saw ski troops committed prematurely and with a lack of preparation, leading to heavy losses; like their enemy, the Russians were often short of skiers. Probably most was achieved by units from Siberia that had not been committed during the first months of the German invasion. However, it is a truism that no plan, however carefully laid, survives contact with the enemy unscathed; while the Red Army General Staff was pleased that some territory was recaptured during winter 1941/42, there was disappointment that winter operations had not led to 'the immediate annihilation of primary enemy groupings on the battlefield'.

Study of War Experience (Autumn 1942)

The result was a new volume on fighting in winter conditions in the *Study of War Experience* series, compiled as a post-action analysis in the autumn of 1942. While this study took a more strategic approach than *Combat in Winter*, it also filled in a number of points of detail. Greater failings were attributed mainly to lack of training and tactical finesse. These included failures of communication between large formations; unwillingness to tailor units to the task in hand; insufficient attention to the winter road network; and over-willingness to throw all resources forward against ambitiously distant objectives, not considering that 'a simple advance does not always justify itself'. Now the aim was clarity of purpose, with winter operations aimed primarily at the 'destruction of a specific enemy grouping'. Interestingly, *War Experience* also demanded that army commands should

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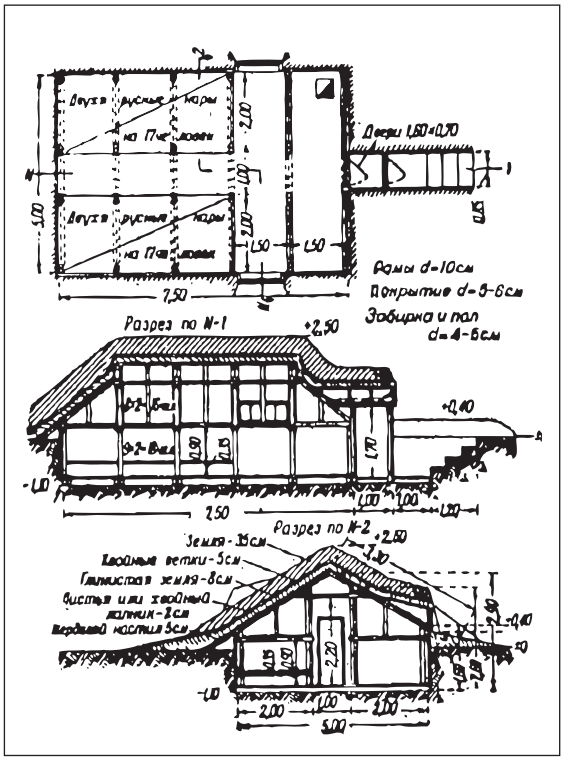

Top, side and end elevations of a 34-man 'dirt hut' shelter, from the Soviet *Regulations for Combat in Winter*, which recommended that garrisons of defensive positions be kept as warm and dry as possible by providing such shelters for first-aid and command posts and for sub-units rotated back from their trenches. Building materials were strictly local, and metal fittings and nails were unnecessary. Partially dug-in, the hut was roofed with 0.5m (16in) of clay, earth and pine timbers in sandwich layers, so gave some overhead splinter-protection; some examples were also loopholed for defence, though their purpose was to shelter Soviet troops from the winter climate. This hut measures 5m wide x 7.5m long (16.5 x 24.5ft), plus an entrance tunnel with outer and inner doors that leads into a front compartment, presumably for stowing gear and wet clothing. Heated by slow-combustion stoves, it could accommodate a whole Red Army platoon.

organize 'combined arms combat' on the main axis of operations, and that ski brigades operate in close co-ordination with them, attacking by 'envelopments'. In winter defence, commanders were encouraged to think in terms of 'main defensive zones', covering road junctions and protecting populated areas.

Tactically, it was observed that the Germans tended to defend populated areas, but 'the presence of gaps between individual centres of the defence create favourable conditions for infiltration by small mobile detachments … which, in isolating centres of resistance, disrupts co-ordination of fire; pressures the enemy rear, headquarters and lines of communication; and disorganizes control. Usually the advance is conducted along roads. However… envelopments conducted over an area without roads, when possible, acquire great significance'. (Just such tactics were used in the Caucasus, where the Germans noticed that small pockets of Russians concealed in the snow became, as if by magic, a battalion overnight.) During approaches, particular care was required in reconnaissance and in the siting of staging posts. On Lake Seliger it was a failure to correctly identify roads that led to the diversion of tanks and artillery during an attack by 360th Div, while at Malaya Vishera disaster ensued because a Rifle division occupied a staging post too close to the enemy perimeter and was decimated before it could deploy.

In the majority of cases infantry was to attack without skis, supported by tanks moving over roads or areas least impeded by snow, while artillery on sleds moved up with the infantry formations. Movement could be speeded by dragging infantry behind tanks on sleds. A key objective of the encirclement battle in winter was to prevent the Germans from creating all-round defences based on populated areas.

Soviet officers were called upon to exploit darkness and surprise during the long winter nights, this being proven to reduce casualties and obtain maximum results even with modest numbers. Nevertheless, 'night offensive plans' were to be 'simple in concept and with limited objectives'. Such a scheme might, for example, involve infiltrating between enemy strongpoints from the front to assemble at a pre-arranged point in the enemy rear, from which they might form a surprise element to support another frontal attack, or destroy command-and-control or artillery targets. Troops were to operate with particular regard to 'cover, concealment and measures for preserving warmth', wearing warm jackets rather than overcoats, clean camouflage cloaks, dry boots, gloves, and, if possible, carrying hotwater bottles.

Soviet ski battalions consisted of three rifle companies plus a mortar company. Valuable as they were, a lack of ready supply from the rear limited their radius of operations, and *War Experience* offered recommendations for the future. These included provision for 80 sleds as part of the 'administration platoon', or their substitution with *travois* or other means when sleds were not available. An increase in the number of automatic weapons was recommended, and the replacement with 82mm mortars of 50mm tubes, since the latter were

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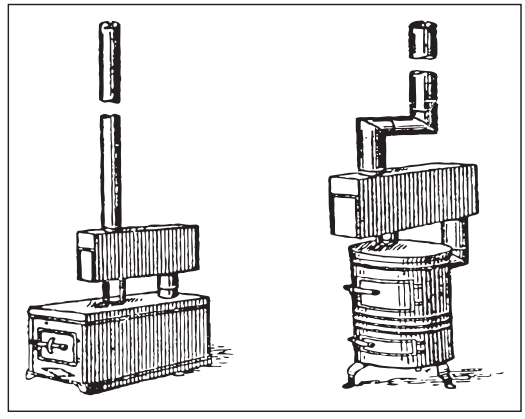
ineffective in deep snow. Ski kit would be 'cotton trousers, woollen underwear, a camouflage smock, gauntlets and a hat', the skis being worn with soft bindings. Radio communication was intended to become universal, with ski brigades to act in the 'enemy's operational depth', and separate ski battalions to fight in his rear during the winter campaigns of 1942/43.

In going over to the defensive along their entire Eastern Front in the winter of 1941/42 the Germans created a deeply echeloned defence. However, despite the extensive use of forced labour, they had 'comparatively limited manpower at their disposal, [so] were not able to create a continuous and tight defence. As a rule, their defence consisted of strongpoints combined into centres of resistance. This gave them an "island" nature. The gaps between the strongpoints were monitored by patrols or individual tanks, and covered by fire. The … nature of the enemy defence facilitated penetration and isolation of centres of resistance, and destruction of the enemy unit by unit. With the capture of a strongpoint the system of defence was disrupted, and there arose the possibility of developing the penetration of the enemy's tactical defence front'.

To the Germans, it seemed that the Red Army came to make a positive virtue of fighting in winter. General Rauss would later observe that 'the Russians preferred to carry out their major offensives in winter because their troops were accustomed to that season and very well equipped and trained for it. The Russians were superior to all peoples in Central and Western Europe in enduring rigours of weather and climate. Casualties from cold were an exception in the Red Army. Soldiers with frostbite were severely punished'. It did not appear at all coincidental that the Soviets often launched major offensives in cold weather: west of Moscow in the winter of 1941//42, the encirclement of Stalingrad a year later, the attack south-west of Kiev in the winter of 1943/44, and their final offensive in Germany beginning in January 1945.



Soviet field stoves fitted with 'spark-catcher boxes', from *Combat in Winter*. The oblong, collapsible iron field stove was designed for use in small tents and weighed about 7kg (15lb); the larger cylindrical type weighed 47kg (103lb), and was for use in huts or the big USB-41 tent. Warmth was essential in winter, but stoves had to use low-smoke fuels sparingly, and only in conditions of poor visibility.

Infantry of Gen Hoth's Third Panzer Army, supported by a Sturmgeschütz and armoured cars, advance through the streets of Klin, north-west of Moscow, in November 1941. Apart from whitewashed helmets and vehicles few concessions to the weather are visible. The Wehrmacht greatcoat was smart, but when it had to double as a blanket by night it had few thermal qualities compared to padded or layered clothing, particularly when wet.

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The 1936 model German 5cm platoon light mortar had a range of about 500m and a rapid rate of fire, but – like other light ordnance – its effectiveness varied widely with ground and weather conditions. Soft ground and snow cushioned the already limited lethality of its round, but ice and rock increased fragmentation. In low temperatures both mortars and howitzers tended to fire short for the first few rounds.

DISASTER ON THE *OSTFRONT*, 1941–42

German catastrophe in Russia in the winter of 1941–42 was not the result of any ignorance of 'General Winter', since German armies had fought on the Eastern Front in World War I. General Blumentritt later remarked that German staffs soon stripped shops of maps and books on Russia: 'Napoleon's campaign was the subject of much study. Kluge read General de Caulincourt's account of that campaign with the greatest attention: it revealed the difficulties of fighting, and even living in Russia'. More pertinently, the recent Soviet manual *Regulations for Combat in Winter* was soon obtained and translated.

The main factors in the winter halt before Moscow were over-confidence bred of easy summer victories, and serious miscalculation – of the time needed to catch, fix and beat a numerically superior enemy in a vast space; of just how early the snow might come, and how low temperatures could fall. Germany's seizure of other countries in a matter of weeks lent confidence that similar Blitzkrieg methods would work against the Soviet Union within a few months. Arguably the clearest sign of complacency was to be found in Hitler's own orders: Führer Directive 21, issued in December 1940, demanded that German armed forces be prepared 'to crush Soviet Russia in a rapid campaign', and Directive 32 of June 1941, just before the invasion began, outlined what would be done after the successful conclusion of a campaign that Hitler assumed would end before 'late autumn'. With the enemy expected to capitulate once the invasion reached a line from Archangel to the Volga there would be no winter fighting, so no need to prepare for it.

The German meteorologist Dr Franz Bauer noted that the last three winters had been severe in Russia, but past records revealed no example where there had been four such consecutive seasons. His prediction that winter 1941/42 was likely to be normal, or even mild, proved catastrophically incorrect. While weather certainly affected both sides, it is usually true that to attack in sub-zero temperatures is more difficult than to defend, particularly in places where the defender has shelter or has been able to dig in before the ground freezes. The latter stages of Operation *Typhoon* fitted this scenario, and the intended final thrust on Moscow coincided with a dire temperature drop – to minus 20° C on 2 December 1941, and as low as minus 38° a few days later. Hitler ordered an end to 'all major offensive operations' on 8 December, and he would come to react testily to the very mention of Napoleon – a name that inevitably summoned up the spectre of winter defeat in Russia.

Emergency clothing

General Halder claimed that Army High Command took preliminary steps for supply of winter clothing in the late summer. Ski requisitions did start before autumn, but little progress was made in producing, still less in transporting and delivering all the paraphernalia required in the depths of

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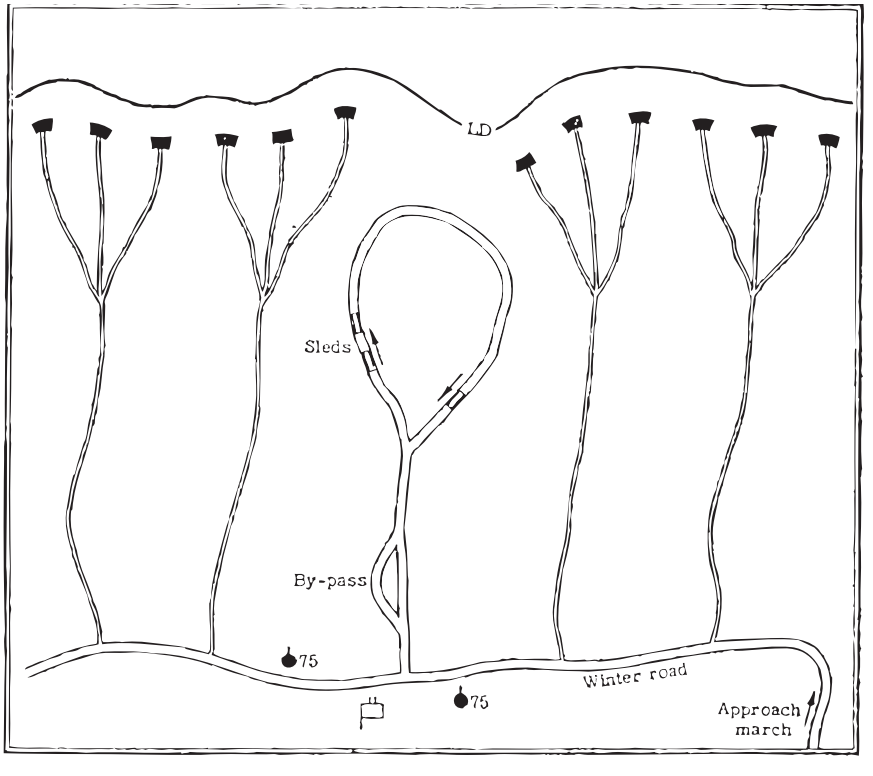
winter. Supplies of civilian clothing were now sought from the home front through the emergency collection by the *Winterhilfswerk* 'Winter Relief' organization. Leutnant Gottlob Bidermann, fighting with 132. Inf Div, remembered clearly the arrival of the 'warm ski sweaters, fur vests, sports clothing, heavy blankets and wool mittens' donated in Germany – but not until February 1942, which was too little, and far too late. As the ever-analytical Gen Rauss related:

Horse-drawn German artillery on the Eastern Front, early 1942. Again, apart from woollen gloves and toques, turned-up coat collars, and a splash of whitewash on the 10.5cm light field howitzer, there is little visible adaptation to the conditions.

> The Germans, if they had any winter clothing at all, carried only the regular issue overcoat, sweater, belly band, and hood [toque] designed for winter wear in Germany. The bulk of the winter garments donated by the German people did not reach the front until January 1942, after the cold had done its damage. Frostbite casualties were numerous… During the inactivity of the autumn 1941 muddy period, fur pieces and felt boots were manufactured locally, purchased [or looted] from civilians, or removed from dead Russian soldiers; but these sources supplied only a small number of the troops. All available underwear was issued so that several sets could be worn at once, and each man managed to obtain a piece of cloth for use as a belly band



German method of deployment in winter, reproduced in the translated US manual *German Winter Warfare* (1943). The advance begins from a 'winter road' – either a cleared road, or a new stretch of compacted snow forming a marked temporary road – where artillery ('75') is deployed. From this, patrols and sleds create new trails forward to the line of departure – 'LD' – and sleds establish a circulating shuttle route to and from the front lines. Prior to the attack the infantry move as far forward as possible on skis or on foot along the trails.

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or head protector. Some Germans acquired Russian-type fur caps, which proved dangerous, since despite the addition of distinguishing insignia the wearers were often mistaken for enemy and fired upon by friendly troops.

Sometimes getting hold of warm Russian clothing took an extreme effort. Edmund Bonhoff recalled that getting the boots off a frozen corpse was well-nigh impossible, so the legs were sawn off 'and stood up against a stove, and when the legs had thawed, we pulled them out and dried off the boots'.

One staple of Soviet propaganda farce that season was 'Winter Fritz', a ridiculous character clad in a uniform padded with newspapers, stolen mitts and outlandish ladies' drawers. There was a kernel of truth in the lampoon, as letters from signals NCO Helmut Pabst make clear:

> The motorized boys call us the Hunger Division, always on the spot, without a supply echelon, waifs and strays… We get no boots or shirts

E

GERMAN DEFENSIVE POSITION; RUSSIA, 1941–42

(1) Battalion position

This typical layout is as outlined in the *Taschenbuch fur den Winterkrieg* (1942). Since German forces often lacked the strength to create continuous fronts, defence frequently took the form of a series of positions, often straddling a roadway, and preferably within reach of village houses to afford some shelter in the rear. Such positions might be echeloned in depth for mutual support, and to create zones that were difficult to penetrate in one attack. A series of strongpoints (**blue dots**) have been linked by zig-zagging trenches to form an all-round defence, behind barbed wire rigged for deep snow conditions. Only a portion of the garrison mans the front position, while strong reserves (**R**) are kept back under cover from the enemy and the elements. In addition to the main road, networks of tracks (**pale brown lines**) have been created to allow supplies and reserves to come up quickly. In this way the garrison can be reinforced with fresh troops more rapidly than the attacking enemy can bring up his reserves.

(2) Barbed wire defences. It was difficult and laborious to sink stakes into frozen ground, and usually defensive wire could only be anchored in the snow itself. (**2a**) shows an 'apron wire' obstacle strung on wooden tripod trestles. These could be prepared in advance in large numbers, and brought up from the rear at need. Tripods for a whole section of wire could be laid flat while the wire was stapled to them, and then erected together; the longer, sloping stake faces the enemy. (**2b**) Barbed wire rolls on pole frames were better for snow conditions than *chevaux-de-frise* 'knife rests', since their lighter ground pressure prevented them sinking into the snow.

(3) German soldier, 1941/42

The failure of the Wehrmacht to provide adequate winter clothing before the snows of late 1941 is notorious, and this man's additions to standard uniform are largely improvised. The woollen *Kopfschutze* or toque was an issue item; this man has obtained two, and wears one under and one over his field cap. The standard greatcoat was worn two sizes too large if a man could get one, to fit over layers of jumpers, and newspaper 'lagging' tied around him with string – the German manual actually illustrated how to do this. The coat skirts are tied tightly around his legs with strips of cloth in an attempt to conserve warmth. Again, if possible the standard marching boots were worn over-large, to accomodate Russian-style foot cloths and more newspaper or straw inside them. For static duties this man wears boat-like local over-boots of plaited straw; these were made both with and without leg pieces, and this mismatched pair are copied from a photograph.

(4) German sentry, 1942

This man's gear shows a moderate improvement. He has received a *Pelzmütze* cap with an insulated lining and additional fur-lined front and ear/neck flaps; like most headgear, this fits over his thin toque. The watch coat (*Übermantel*) was in fact introduced in the German Army as early as November 1934, but was not available in sufficient numbers for general issue during the first winter in Russia. It was longer and more generously cut than the greatcoat, with extra lining, a larger fold-up collar, and extra 'hand-warmer' pockets over the ribs (though these could not be used when wearing rifle equipment). It also had a folding hood buttoned below the rear of the collar, but since this was made of thin drill cloth it was useless in seriously cold conditions. The issue over-boots for static duties were made of brown felt and black leather, with buckling straps across the instep, and had wooden soles 3cm (1.1in) thick. Grey knitted woollen gloves were standard issue.

(5) MG34 with snow board

A critical weapon in any German defence was the excellent MG34 light machine gun, with a cyclic rate of 800rpm; this could be fed by either a disintegrating-link metal belt or a small 50-round belt-magazine, and it could be moved swiftly from one threatened point to another. To prevent freezing in cold weather it was kept wrapped and dry whenever possible; the trigger could be freed up with a few drops of kerosene, but the gun was not oiled until it had been warmed up by firing. Here the bipod is mounted on an improvised snow board, made by screwing a plywood platform to an old cut-down pair of skis. This spread the weight, preventing the bipod from sinking into the snow, and allowed ease of movement. It was desirable to relocate the gun from time to time, as snow in front of the muzzle would become discoloured and conspicuous.

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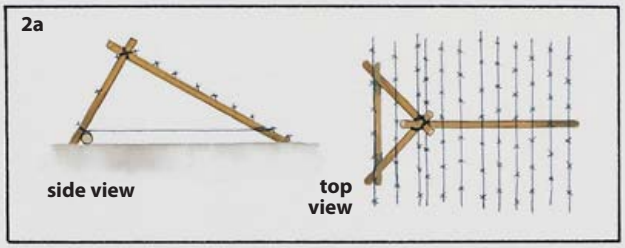

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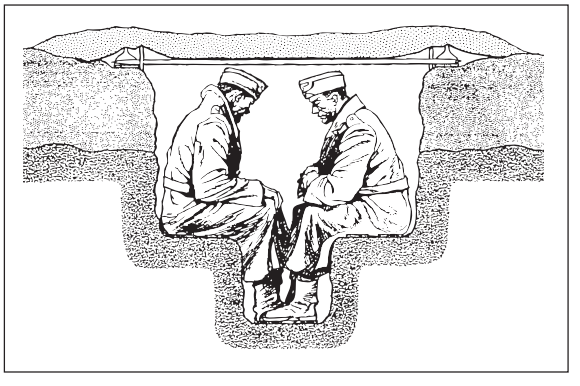
when our old ones wear out; we wear Russian trousers and Russian shirts. And when our boots have had it, we wear shoes and Russian puttees – or else make the puttees into ear muffs… The foot-sloggers protect themselves as best they can, with fur gloves, woollen caps and quilted trousers… I have a coat again [but] it's old, it has seen two campaigns. The collar's greasy and the pockets are out of shape – just the job for Russia, for someone who wants to bury his hands deep in his pockets and keep his pipe in his mouth; for someone who wants to create a vacuum round himself … We bound our boots with rags and watched each other's noses. When the tip of the nose goes white, it's time to do something about it. Franz and I were riding with the advance party. Franz couldn't get into the stirrups because of the rags around his boots. He took off his gloves to undo the wire that held the rags together. Two of his fingers were frost-bitten.

By now the Red Army was fighting back. As Gen Rauss recounted:

> Cold reduces the efficiency of men and weapons. At the beginning of December 1941, 6th Panzer Division was but nine miles from Moscow and 15 miles from the Kremlin, when a sudden drop in temperature… combined with a surprise attack by Siberian troops smashed its drive on the capital. Paralysed by cold, the German troops could not aim their rifle-fire, and bolt mechanisms jammed or firing-pins shattered in the bitter winter weather. Machine guns became encrusted with ice, recoil liquid froze in guns, ammunition supply failed. Mortar bombs detonated in deep snow with a hollow harmless thud, and mines were no longer reliable. Only one German tank in ten had survived the muddy season, and those still available could not move through the snow because of their narrow tracks. At first the Russian attack was slowed with hand grenades, but after a few days the German prepared positions in villages and farmhouses were surrounded or penetrated.

TASCHENBUCH FÜR DEN WINTERKRIEG (1942)

Though there was various piecemeal specialist advice, the definitive German manual *Taschenbuch für den Winterkrieg* ('Pocketbook for Winter Warfare') appeared only in August 1942, being distributed in preparation for a second winter in the East. (It would be translated, slightly re-edited, and issued by US Military Intelligence late in 1943 under the title *German Winter Warfare*.)



The *Taschenbuch's* section through a deep snow pit for seated personnel. The pit was dug vertically down, and depending upon snow depth could be made either for several men prone or, as here, for one or two seated. Ideally the roof – made with skis and ski sticks, or branches, covered with shelter-halves and snow – was sloped towards one end.

The Pocketbook was extensive, simple to understand, well illustrated and well researched, though episodic in approach; like many others, it bore evidence of being cobbled together from recent German experience and emergency measures, with elements gleaned from Soviet instructions that themselves drew upon Finnish sources.

In its original, the *Taschenbuch* begins with remarks on the influence of winter upon combat, preparations for winter warfare, the *Schlammperiode* or *rasputitsa* when mud enveloped the Eastern battlefield, and general

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winter combat methods. For the individual soldier success under such conditions depended not only on acclimatization, training and 'toughening', but on the nurturing of the will to resist its hardships. Morale was accordingly to be bolstered by the 'intelligent ordering of spare time' to prevent brooding, rumour-mongering and disciplinary problems, with the welfare of the front-line soldiers taking priority. Supplies were to be pushed forward, not allowed to linger in depots and orderly rooms. Along with more practical items, newspapers, field libraries, and even 'Strength Through Joy' performing troupes were to be provided whenever possible.

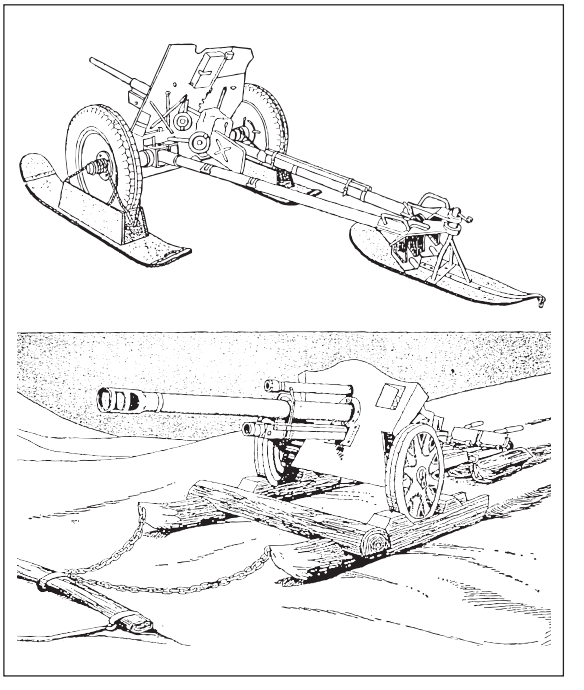
The *rasputitsa*

The general misery was expected to begin 'about the middle of October' with the commencement of the *Schlammperiode* or 'mud period', and to end only after the spring thaw worked its way northward from March, accompanied by another spell of mud or even 'gigantic floods'. Interestingly, both the Russian term *rasputitsa* and the Finnish *rospuutto* contain connotations of muddy highways or 'roadlessness'. Yet the conditions of the *Schlammperiode* were geographically uneven, depending on temperature and ground: over light sandy areas water drained away, but in heavy soils, such as the dark humus of the Ukraine, the result was deep, often impassably sticky mud. Sometimes a road might freeze hard at night only to warm during the day. As observed by Gen Hermann Balck, commanding 11. Pz Div, variations in ground might cause one unit to become stuck fast though another retained mobility, with the result of slow and unco-ordinated movement. General Heinz Guderian noticed that on his line of march some snow actually fell before the worst of the mud:

> The first snow of the winter fell. It did not lie for long and, as usual, the roads rapidly became nothing but canals of bottomless mud, along which our vehicles could advance only at snail's pace and with great wear to the engines… The next few weeks were dominated by the mud. Wheeled vehicles could only advance with the help of tracked vehicles. These latter, having to perform tasks for which they were not intended, rapidly wore out…

The *Taschenbuch* was unequivocal: in this *Schlammperiode* unmetalled roads were 'impassable to wheeled and tracked vehicles', and while well metalled roads continued to function, where these traversed depressions they could flood, as would deeply excavated combat positions. The only remedies were to make field works 'mud proof', and not to attempt unpaved roads until they dried out. Most attempts to improve such roads were futile, the time and effort needed being greater than that of creating an entirely new route around the worst ground.

Inexorably, winter followed mud, and according to the *Taschenbuch* snow cover lasted from about four months in the Ukraine to



A 37mm AT gun mounted on ski runners; and (below) a 10.5cm howitzer mounted on heavy treetrunk sledge runners. These could be constructed at unit level, thus allowing heavy or bulky equipment to be moved; the disadvantage was that they usually did not fit the narrower trails already consolidated by conventional sleds. Both illustrations are from the 1943 US manual *German Winter Warfare,* translated from the *Taschenbuch*.

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anything up to seven in the far north at Archangel. In wooded terrain the Russian winter snows tended to lie evenly – anything from just 4in deep in the south, to 3ft in the north. Out in the open of central and northern Russia drifting was more likely, creating areas where the snow might be 10ft deep.

Snow conditions – tactical lessons

The *Taschenbuch* claimed that really there were 'no special winter tactics', but deep snow acted as a 'hampering' factor to normally equipped troops, while ski troops and sleds now took over tasks usually assigned to mounted, motorized and cycle units. As a rough yardstick it was suggested that the disposition of forces would take 'more than twice' the time needed in summer. In preparation for winter warfare the soldier was to be hardened to live in simple bivouacs, often of his own making; and trained in protection from cold and snow, in improved mobility through skiing, sleds and road improvement, in the construction of special defences, and in firing and combat in cold and snow. 'Freedom of action' had to be maintained, with troops trying

> … in every possible manner to attack the enemy, to damage his installations and to destroy him. Mobility on the battlefield and the ability to deceive and outwit the enemy give even a numerically weaker force a feeling of superiority. The ability to carry out a march in winter may be the basis for the successful outcome of a battle. If possible, the enemy must be surprised, and surprise is more likely if the troops avoid highways and roads and move across terrain which is considered impassable…

While frontal attacks in deep snow were very difficult even when executed on skis, continuous attacks were desirable in order to deprive the enemy of opportunities to rest or warm himself, and to force him to make frequent counterattacks. Wherever possible he was to be isolated by cutting his communications. To these ends the maintenance of even a weak mobile force was vital, be it specially formed units, patrols or raiding parties.

Conversely, troops had to be prepared to dig in rapidly once they reached effective weapon range; to lie in open terrain for long invited heavy casualties from both enemy fire and the cold. Proper defences required both time to construct and the commitment of reserves along tracks leading up to the area of operations, and to be effective they had to be held as an 'uninterrupted line', preventing enemy infiltration in poor visibility. Those preparing a defence had to be aware that terrain impassable in summer weather, such as swamps and water obstacles, lost their effectiveness in winter. The Soviets favoured making approaches up valleys and ravines, which had to be blocked with obstacles and secured with adequate forces. Static defence lines were protected by active reconnaissance and 'aggressive' patrolling. The remedy after any enemy success had to be an immediate counterattack before the Russians could gain a foothold, since they were 'very fast at digging into the snow'.

Movement & orientation

Early and thorough reconnaissance was the precursor to winter marches, with attention paid to depth of snow, type and condition of roads, dangers from avalanches and falling rocks, wind protection, possibilities for detours around

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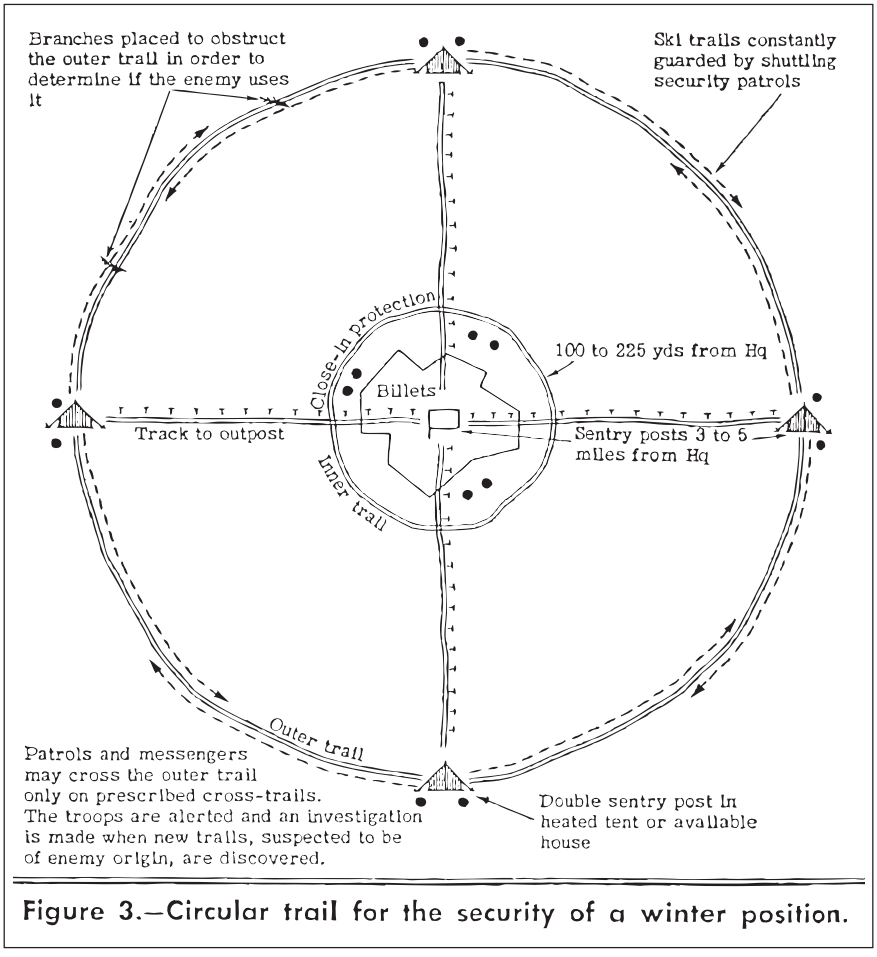
Branches placed to obstruct the outer trail in order to determine if the enemy uses it
Ski trails constantly guarded by shuttling security patrols
Close-in protection
100 to 225 yds from Hq
Billets
Track to outpost
Sentry posts 3 to 5 miles from Hq
Inner trail
Outer trail
Patrols and messengers may cross the outer trail only on prescribed cross-trails. The troops are alerted and an investigation is made when new trails, suspected to be of enemy origin, are discovered.
Double sentry post in heated tent or available house

Figure 3.—Circular trail for the security of a winter position.

US translation of the plan from the *Taschenbuch* showing circular trails used for protection of a position in winter. Patrols revolve around an inner trail 100–225 yards out from the billets, and, on skis, between outposts established 3 to 5 miles out.

obstructions, and the effects of ice. In preparation for movement soldiers were not allowed to shave, and were issued with anti-frostbite preparations. March rations were wrapped and carried close to the body, vital weapon parts such as rifle bolts were protected against snow and moisture, and men were encouraged to march with rifles slung and hands in pockets. Vehicles required tow-ropes and planks for unditching, but solo motorcycles were best loaded onto sleds. Special road-clearance and towing detachments had to be incorporated into the column of march, or disposed at vital points en-route. Wherever possible, field kitchens and shelters were likewise provided.

Columns themselves were to keep moving during severe cold, and 'standing around', particularly in windy conditions, was to be strictly avoided. A detail brought up the rear of the column to pick up exhausted stragglers and broken vehicles. On longer movements halts were inevitable, but best kept to five or ten minutes. Halting places were to be sheltered, or protected by snow or branch windbreaks in open terrain. Where lengthy stops were unavoidable, tents were to be pitched and 'snow caves' dug for protection. The men then put on whatever extra clothing they had or draped themselves with shelter-halves or blankets. Horses were similarly covered and put close together for warmth. Guards were allotted not merely to act as sentries, but to wake each man individually after set periods to prevent them from freezing, while vehicle engines required periodic running.

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Tracked artillery of any sort was at a premium in winter; it could usually cross moderate snow and climb slopes, and get into action without lengthy setting up. This Panzerwerfer 42, a 15cm rocket-launcher mounted on an Opel Maultier SdKfz 4/1, is in service with a Waffen-SS *Nebelwerfer* unit in 1944.

Orientation in snow was no easy matter; leaders therefore had to pay special attention to features such as ridges, woods and telephone lines that showed above the snow, making repeated compass readings and checking sun direction and shadow. Though fog might blot out virtually everything, sound and smell might reveal much, and to this end frequent stops and the wearing of a cap rather than the steel helmet were recommended. Men sniffed the air for newly cut timber, factories, and stables, while dogs were useful to follow trails or detect habitation and fires beyond human senses. Memoirs also speak of 'trench dogs', like the 'smallish, wolf-like mongrel' assigned to Lt Armin Scheiderbauer's unit later in the war, to alert men to 'alien elements in the trench'. Another technique for orientation was the 'Finnish method' of deploying 'direction squads' under a selected leader. Nevertheless, getting lost was a constant danger, and in such eventualities troops were to maintain calm, mentally retracing their steps. On no account was hasty and ill-considered action to be undertaken; the main group, and especially any exhausted men, were to stay still and seek cover from the elements, while a patrol conducted systematic searches for the route.

Clearing routes

Creating roads in winter was not to be regarded as a purely Engineer function but the duty of all arms of service. Often tracks were commenced by skiers, followed up by trail details; they cut across flat terrain, perhaps following frozen rivers, telegraph poles or fences, avoiding places where drifting was likely, unfrozen boggy terrain and similar obstacles. Often it was best simply to flatten the snow with marching feet and sleds, but various means could be used, including improvised wooden snow-ploughs pushed by horses, and wooden rollers. One method learnt from the Finns was a sled with a wooden reservoir containing hot stones and water. As the vehicle advanced the liquid was allowed to spray out through small holes, and as the water was no longer warmed it froze on contact with the ground, creating a hard ice track. Units reconnoitering routes were to report road conditions as a numbered scale with individual scores for weather conditions, state of repair and road capacity; zero indicated the best going, with higher numbers showing problems. A report of '443', for instance, indicated a hard crust on a single-lane road with by-passes suitable for tanks and horse-drawn vehicles; and an '846' was particularly unwelcome, indicating a two-lane road entirely buried in drifted snow and closed to all vehicles. Ideally, snow fences were erected to prevent drifting across the routes, and mass employment of manpower for road clearance commenced immediately after the first snowfalls.

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Where routes crossed frozen water, march intervals and loading had to be varied according to ice thickness. The *Taschenbuch* provided a handy table indicating, for example, that 4cm (1.6in) of ice was adequate to support individual soldiers and skiers advancing at intervals of 5m apart. Once the ice was 15cm (6in) thick it could support march columns of infantry or cavalry, and towed light field artillery, provided intervals of 15m between elements were preserved. Panzer III and IV tanks could proceed across ice 40cm (15.75in) thick at 40m intervals, but for safety heavier tanks and artillery needed 60cm (24in) of ice.

Road marking was best done before the first snowfall, using poles 2.5m (8ft) high, cairns or flags, set a metre or more back from the track to avoid being hit by traffic. After heavy falls 'snow men' could be used – pillars made of blocks of snow a metre or more in height, preferably at set intervals along the line of march. The best 'snow men' had a pane of ice set into them to reflect light, and were stained a contrasting colour (with coffee grounds, or simply by urinating on them). When time was lacking substitute direction indicators might be created from boards, paper or paint on trees, or temporary marks made in the snow with ski sticks. On the outskirts of Stalingrad even these could be dispensed with: as Joachim Wieder recalled, 'the frozen carcasses of dead horses half hidden in the snow formed a kind of trail, and showed, by bloody red gashes, that hungry soldiers had cut out coveted chunks of meat with their knives and bayonets'.

Railways

With road and cross-country movement difficult railways became even more important, but rolling stock needed preparation. Russian rail gauges were not the same as those of central Europe, and certain types of German locomotive with exposed pipe work proved vulnerable to freezing. Freight cars and any passenger wagons unequipped with stoves led to personnel freezing in transit. The *Taschenbuch* recommended sealing carriages with paper and straw, and the construction of wooden compartments for AA-gun crews and field kitchen staff. Vehicles in transit might have their batteries removed and radiators covered. Stoves required supplies of fuel, but in

December 1942, Saarbrücken: German troops in new padded winter clothing, as tested in Finland and approved in April 1942. This two-piece uniform was initially produced in various shades of grey, usually reversible to white. It was only the following year that a million sets of the *Wintertarnanzug* ('winter camouflage suit'), reversible from white to a printed camouflage pattern, were ordered.

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The snow-camouflage *Windbluse* for mountain troops was available to those specialist units – but not as general Army issue – from 1938; a second model reversible from white to olive brown was produced from 1942. These Gebirgstruppen also wear white elasticated cloth covers over their mountain caps, and note the white rucksack cover in the foreground; such refinements also appeared in 1942.

emergency this could be taken from the engine supply. Strict injunctions were issued against the burning of furniture and equipment, or the stealing of stoves from trains, both of which appeared to have occurred on a regular basis. Wherever possible hot drinks were provided at rail stops, and the men were ordered to detrain and 'engage in callisthenics' at any long halt.

Clothing

According to the *Taschenbuch,* ideal clothing for winter was not 'too warm', but had to be windproof and allow for rapid movement, ideally with dry felt boots and white camouflage. That this utopian ideal was not universally achieved was demonstrated by the detailed advice that followed:

> Extra underwear and an under-jacket should be worn as protection against the cold. Blankets warm the body better than overcoats. If the underwear is wet and there is no chance to dry it, it must be worn over the dry extra underwear and the under-jacket. Otherwise if the wet underwear is taken off, it freezes stiff. The changing of underwear must be enforced. Several layers of clothing keep a man warmer than one thick garment. All tight-fitting articles of clothing must be loosened. Rags and newspapers pushed in several layers into the trousers and under the jacket (especially near the chest, abdomen, and kidneys) are good protection. Ear muffs, knitted wool caps, mufflers, wristlets, and gloves complete the bivouac uniform. Shoes must be put on again after socks are changed in extremely cold weather in order to prevent the leather from freezing stiff. During the night the haversack may be used as a foot sack to warm the feet.

Whilst every effort would be made to issue 'additional clothing', the use of 'expedients' was expected. The *Feldmütze* was to be worn over the knitted woollen toque with its flap down over the ears and back of the head, and the *Feldbluse* over a regulation sweater and under-jacket. Motorcyclists would add another sweater. Short field jackets were still to be worn long enough to cover waist and kidneys, and riding breeches not so tight as to restrict circulation or knee movement. The pleat at the back of the greatcoat was to be worn open, and surcoats and protective overcoats likewise worn 'long and roomy'. In the worst weather the steel helmet could be worn over both field cap and knitted woollen cap. Footwear was to be large enough to allow toe movement even with inner soles and two pairs of socks.

Under the heading of 'emergency measures' the *Taschenbuch* further recommended lining the steel helmet with 'the crown of an old felt hat', a handkerchief, or crumpled newspaper; lining boots with straw, cloth or paper; and covering boots with socks, fur, or locally-made straw overboots. Trouser bottoms were allowed to hang outside boots, and mounted men

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could wear protective caps of cloth, leather or fur over their ordinary footwear. The use of paper was elevated to something of an art form, with the creation of hoods of newspaper and even face masks of crepe paper. The *Papierweste* was made by cutting a head aperture in newspaper and tying it around the chest with string. The genitalia being especially vulnerable to cold, it was recommended that 'short trunks' be worn in addition to underwear, or paper put between trousers and underwear. Nevertheless, Gen Guderian recorded the deaths of many men 'while performing their natural functions'. As well as paper, units were to be provided with 'foot cloths', sleeping bags and sheets. In snow storms those equipped with fur coats turned them inside out and wrapped a shelter-half around the outside. The result of so much padding could be incredible bulk: Armin Scheiderbauer described how a small shell splinter penetrated his winter overcoat and 32-page map to lodge harmlessly between his winter clothing and tunic.

The *Taschenbuch* required 'extensive use' of white clothing for snow camouflage, referring to issue two-piece uniforms and white cloaks, but in 1942 it was aware that demand outstripped supply, with ski troops, sentries, and similar personnel enjoying priority. Issued white clothing was to be supplemented with 'old underwear, sheets, and other old garments' worn cape-style, perhaps with a towel fixed to the headgear and allowed to drape over the shoulders, where it was pinned. Camouflage was improved if white gloves were available, transparent gauze masks were worn on hoods, and equipment was worn under the white cloak. Understandably, in winter warfare, everybody looked much the same; accordingly, the *Taschenbuch* outlined a system of black and red identification armbands buttoned to the left or right upper sleeves. By providing two brassards of each colour and two positions in which to wear them, a total of eight combinations was possible, which could be changed just like passwords. For identification from the air flags laid flat were the standard method, but stamping a large swastika into the snow offered a simple expedient.

To preserve clothing in good condition, NCOs were instructed to supervise cleaning, mending, and the use of civilian or field laundries. Footwear was stuffed with paper or rags and dried slowly to prevent cracking, then greased against the wet. Rubber footwear, being in short supply, was not to be used for marching on paved roads, nor cleaned with sharp instruments. During rest or march halts repairs were made, and the clothing of wounded men was 'collected and turned in without exception'. Underwear was washed whenever possible, not so much to clean it and remove lice as because 'clean underwear will keep the soldier warmer'. Wherever possible troops would receive a warm shower once a week, finishing with a short cold shower, and the greasing of face and hands with vaseline, boric acid ointment or cold cream.

Equipment

Equipment was painted or whitewashed, improvised paints being created from scratch with chalk or lime dissolved in water and sometimes improved by the addition of glue. Small arms were not painted, and any camouflaging white cloth strips had to be placed carefully so as not to interfere with their operation. Heavy weapons required cold-resistant recoil liquids, and for the worst conditions all weapons needed frost-resistant cleaning and lubricating oils. Small-arms magazines were best maintained with the cartridges dry but not oiled, and where possible were emptied, checked, and refilled daily;

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machine-gun belts likewise needed checking for clotted oil, rust or ice. In snowstorms guns were left wrapped up, with frequent working of the bolt, and cleaning and re-oiling in quiet times. Though unmentioned in the *Taschenbuch*, there was also a limited provision of 'winter triggers' for the K98k infantry rifle; these were oversized to fit over the mechanism, allowing discharge without the firer removing his mittens. For use in deep snow heavy weapons required snow-plates to stop them sinking.

Shelters & food

German instructions drew substantially on Finnish and Soviet models, including circular plywood shelters, Finnish-type circular tents, earth huts, conical branch shelters, and fir trees adapted by means of a structure around the lower trunk. A distinctively German adaptation was the 16-man *Hauszelt* or 'house tent', created by buttoning together 16 shelter-halves to make a pyramid covering an area of about 25 square metres (270 square feet). Speed of erection and warmth could be improved by sewing the pieces together, and by adding a stove that vented through a ground pipe, to retain as much heat in and under the structure as possible.

Improvisations for deeply frozen conditions included igloos from sawn blocks of dry, hard snow, accommodating anything from four to 50 men, and snow 'houses', 'pits', 'holes' and 'caves'. The 'snow house' used snow blocks for side walls, with sticks, shelter-halves and branches for the roof, all covered in snow for insulation and camouflage; the 'snow pit' was similar but relied on snow for its sides. Small snow pits in deep snow might be dug down far enough to accommodate a few seated men, whose skis, poles and a couple of stakes formed the basis of a roof. Men burrowed snow caves sideways into inclines and drifts, blocking the entrance behind them with loose snow. When sleeping in groups, men were encouraged not to wear too many garments but to use some as blankets and ground sheets. Ideally tent or hut floors were not bare earth, but where they were then fires could be used to thaw the ground first.

Supply lines often broke down in winter, but the *Taschenbuch* painted a picture of the ideal, instructing commanders to distribute more hot food and drink (particularly fats) through field kitchens than in summertime. It was

A somewhat bizarre image of German infantry learning the rudiments of cross-country skiing, on a grass track in summertime. Note how in this *Langlaufen* style the heel of the boot rises from the ski. In cross-country skiing the use of sticks is optional.

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also observed that though some foods suffered loss of nutritional value most lasted unspoilt for longer in the cold. Meat and fish could simply be allowed to freeze, then chopped or shaved for rapid use. When warmth intervened meat could be sliced, dried, and salted on a sheet of iron over a stove for preservation. Conversely, canned and bottled goods required protection from freezing, perhaps by packing wagons and boxes with straw. Troops were to be issued with modest iron rations including powdered coffee and tea, but not overloaded to avoid the danger that they would discard valuable food. Such was the official view; many veterans remembered hunger, and soup that had to be bolted before it froze in the messtin. One *Landser* recalled watching an axe 'rebounding as from a stone off the frozen horse meat', and butter 'cut with a saw'.

German troops in training – apparently an infantry detachment, rather than Gebirgstruppen – marching with skis shouldered on the left, in textbook fashion.

GERMAN SKI TRAINING & TACTICS, 1942–44

While the first winter in Russia exposed huge shortcomings, there was at least one area of German tactics that gave grounds for optimism. Steps to provide the vast numbers of skis required commenced in 1941 with the requisition of all new factory-produced skis in Norway, and fresh orders for more than 400,000 pairs. During 1942 donation drives and purchases netted approximately 900,000 pairs in Germany. The key German military ski tactics manual from the middle war period was *Vorläufige Richtlinien für Ausbildung und Kampf von Skitruppen* ('Provisional Instructions for Training and Tactics of Ski Troops'), published in August 1942 to supersede a less complete document issued during the disastrous winter of 1941. The new instructions were not specifically for specialized mountain units, but built upon the experience of raiding detachments, ski battalions, and 'improvised ski companies' on the Eastern Front, plus 'knowledge gained from the Finnish Army', to create a generally applicable rubric. It was assumed only that trainee combat skiers would gain the rudiments of skiing in its 'Nordic' or cross-country form, and be tolerably familiar with tactics as given in the various editions of the *Ausbildungsvorschrift für die Infanterie*; ski and combat training were now to be 'synchronized'.

The basic style of movement on skis was 'long sliding steps', for which equipment had to be arranged for free movement of the arms, preferably with the rucksack packed as flat as possible and contents arranged to create a low centre of gravity. The bread bag, bayonet, and any other impedimenta

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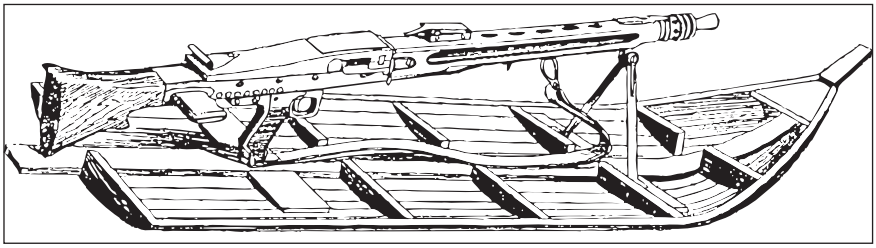

German MG42 mounted on a *pulk* or Lapland wooden sled for snow transport, as illustrated in the US *Intelligence Bulletin* (October 1943). Apart from ammunition and spares the sled might also carry mats for keeping the feed belts out of the snow. If optical sights were carried these were not left on the gun for protracted periods, but carried in pouches close to the gun-team's bodies. Compare this image with Plate H5.

were carried towards the back of the belt with only ammunition pouches to the front. How weapons were carried depended on the degree of readiness required: when out of contact rifles were slung on the back, a second sling sometimes being added to ensure that the weapon remained firmly anchored in place down one side of the rucksack. In the case of 'urgent battle alert' the rifle was held in the right hand, ski sticks in the left.

On the command '*Hinlegen!*' the soldier was to throw himself flat into a basic prone battle position, either with the skis pointed outwards, or onto one side with skis parallel. In standing or kneeling positions ski sticks could be used as improvised rifle rests. Wherever possible, however, skis were shed before coming into combat; fighting on skis was regarded as an emergency measure for encounters only. From the prone position, the soldier could move in a number of different ways according to circumstance. With the skis off, he could revert to movement on foot, dragging the skis, or, if the enemy were near, advance in a crouching position, or push forward using the skis as a sliding platform to prevent sinking into the snow. If a sudden rush was needed the skier could brace himself against the left knee, pushing himself up with the poles in one hand and rifle in the other. While low combat positions were best, ideally pressed down into the snow, deep drifts or undulations might require kneeling or even standing fire. In extremis skiers could throw grenades, stick grenades being preferable as they were less likely than 'egg' types to roll away out of control. When throwing grenades in snow troops were to consider that range might be hampered by heavy clothing and difficulty of obtaining a solid footing, and that fragmentation effects were lessened by deep snow. Throwing from the prone position required practice, the best method being to heave oneself momentarily upward, throwing overarm while resting the left arm on the ski sticks; this gave momentum while keeping exposure to fire to a minimum.

F

GERMAN MINOR SKI TACTICS, 1942–44

These examples copied from the tactical manual have partly been adapted to illustrate the uniforms and equipment of the *Gebirgsjäger* (Mountain Light Infantry).

(1) Double-sling method of securing rifle while skiing. An alternative to slinging the rifle diagonally across the back, this was easier when carrying the Mountain Troops rucksack. One sling was loosened to its fullest extent, the other kept shorter. This man wears the white snow-camouflage hooded anorak and matching over-trousers. Since the Red Army also used snow suits, cloth bands of different colours could be buttoned around the sleeves for quick recognition of friend from foe.

(2) Grenade throwing from kneeling position. The left knee is advanced in the direction of the throw, while the grounded right knee steadies. The left hand, holding the rifle, is also used to pull the fuse-cord of the grenade.

(3) Using two ski sticks as rifle rest. The handles are brought together and the wrist loops of each are slipped over the other, while the left hand braces them.

(4) Using one ski stick as rifle rest. The pole is braced with the left arm, as a monopod. This man wears the rather shapeless white elasticated cover over his *Gebirgsmütze*, issued so that the hood did not have to be worn up at all times for camouflage purposes, thus hampering vision and hearing.

(5) Using double ski stick support in kneeling position. Like the next pose, this involved the tricky sideways extension of the leg without removing the ski.

(6) Prone firing – in this case, with an MG34. Note that the bipod is lashed to an issue wood-and-rope snowshoe to keep it on the surface of the snow.

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Other weapons and ammunition were carried by the ski team in a Finnish or Lap-style *ahkio, ackja* or *akja*:

> It is used in two forms: the boat *akja* and the weapons *akja*. The boat *akja* is used to carry ammunition and equipment. When lined with blankets, it may also be used for the transportation of casualties. In the weapons *akja*, the weapon is mounted and fired from the sled. The light and heavy machine gun, the light mortar and the anti-tank rifle are the weapons most suitable for mounting on sleds. The weapons *akja* is open at the back to facilitate the handling of the weapon from the prone position. In place of the boat and weapons *akja*, other types of hand sleds improvised by the troops may be used.

In snow, when no contact was expected, weapons and ammunition were to be wrapped in shelter-halves against the elements, and loads distributed so that the heaviest part was at the rear. Loads were not usually to exceed 60kg (132lb); thus packed, the *akja* hull presented a good 'angle of attack' to the snow and could be towed by two or three skiers. When negotiating difficult going another skier controlled the *akja* from the rear by means of a brake rope or pushes with a ski stick. Where dog teams were available a rough rule of thumb was that the weight of the burden should not exceed the weight of the dogs. Where action was likely, sled weapons were to be kept ready and loaded for immediate dismounting or firing from the sled. The firer could lie down in the *akja*, bracing his feet against the snow; during relocations other members of the team could haul the sled in brief bounds before throwing themselves down into cover.

Tactical organization and movement

In ski warfare it was recommended that *Gruppe* (squad) be increased to 11 men plus the squad leader, to allow extra hands for the sleds. An ideal allotment of weapons was a light machine gun, two sub-machine guns, two semi-automatic rifles, a sniper rifle with telescopic sight, and six ordinary rifles. While automatic weapons were increased, platoon light mortars were regarded as expendable owing to their reduced effectiveness in snow. Likewise, given stronger squads, the platoon was reduced to three squads. A common deployment for action would be without skis, in a rough skirmish line, with the LMG towards one end of the line. When advancing in skirmish formation the squad leader took point position with the gunners towing the LMG in their sled nearby, and riflemen spread out to either flank. If there was a second sled attached this followed another 20m or so to the rear, attended from behind by the assistant squad leader. Given the exertion required for skiers to break separate tracks, 'this [extended line] formation should only be employed when the intention is to open fire'.

Ordinary point-to-point movement was carried out in various forms of column or file, but longer marches over deep snow by units larger than platoons required the use of 'trail-breaking detachments'. These were often broken down into smaller six- to ten-man details, with individuals assigned specific tasks. Point was commonly allotted to an alert scout with wire-cutters, followed at an interval of about 30m by a 'direction observer', whose equipment included a compass, binoculars and a hatchet. The observer would be followed by the first of the 'trail improvers', then the squad leader (also equipped with compass, binoculars and map). Behind him came the

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remainder of the team, whose task was to identify and improve the path for following troops, using spades, brush knives and marking equipment. Trail markers might include arrows, numbers, broken twigs, papers, or distinctive impressions made with ski sticks; in some circumstances subtle marks were preferred, but usually bold signs with some element of colour were best. As far as possible the trail-breakers chose paths suitable for even weak skiers, avoiding obstacles and sharp turns particularly on uphill segments, and making allowance for sledges. To maintain speed, details were rotated at frequent intervals.

As ski troops often acted independently of large bodies patrol skills were vital, as were alert sentries. Fixed posts had to be well camouflaged, while mobile pickets made use of 'security tracks', circulating at a radius of a kilometre or more around a position. Protection was further increased by mining the approaches, issuing flare pistols to sentries for emergencies, and establishing an inner security track. In extreme cold thought had to be given to allowing sentries 'an opportunity to warm up by vigorous movements', and to more frequent reliefs.

The fire-fight

> In combat on skis the swift execution of all movements… and the ability to deceive and outwit the enemy in every situation… greatly increase the striking power of even small units. Squads and platoons are frequently specially organized and reinforced with heavy weapons and signal and engineer equipment to enable them to accomplish missions independently. Care must be taken that the mobility of the unit is not thereby impaired. Pieces of equipment that might reduce speed must be left behind, or deposited during the approach march at selected points in the terrain. When approaching the enemy, advantage should be taken of poor visibility, such as fog, snow squalls, twilight and darkness. Creeping skilfully and soundlessly toward the enemy is of decisive importance…
>
> Close contact must be maintained within the squad and platoon. It is the responsibility of every unit to keep contact not only with the units to the right and to the front, but also with those to the left and rear. During the attack and pursuit, envelopment should always be sought by utilizing mobility. Only weak forces should be left in front, to deceive and pin down the enemy. It may be practical temporarily to detach the light machine gun of one squad operating on the flanks and employ it frontally. If an attack bogs down in snowy terrain shortly before the objective is reached, heavy casualties result. Therefore a decision must be sought as soon as possible and with the greatest tenacity. In choosing the direction of an attack, consideration must be given to the fact that difficult skiing terrain frequently offers better possibilities for a surprise breakthrough than

A British NCO of No.1 Commando, with a slung Thompson SMG, demonstrates free climbing at Glencoe, Scotland, in November 1941. Commando training for 'cliff assaults' was also carried out on the Cornish coasts. Sometimes a strong climber was used as a lead, paying out behind him ropes carried in a wicker basket.

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favourable skiing terrain. Close combat is usually decided by the use of small arms and grenades. If possible, close combat should be started with a surprise attack – if on skis, by a rapid downhill run. It may be more practical in certain instances to avoid meeting the enemy in hand-to-hand combat and seek a decision through a fire-fight within the most effective range.

In ski combat the infantry fire-fight took on even greater significance than in ordinary warfare. Visibility tended to be better, while supporting arms – such as the artillery – tended to be weaker. Increased use of rifles with telescopic sights improved the possibilities not only for sniping at distance, but for concentrating accurate fire on important targets. Conversely, the problems of resupply made conservation of ammunition crucial. In extreme cold small arms could not be touched with bare hands and gloves or mittens had to be worn, which sometimes reduced the speed and accuracy of firing. In extreme cold, first shots tended to fall shorter than from a weapon that had warmed up. Muzzle blast could displace and blacken snow, creating a shadow that gave away a firer's position.

According to the US appreciation *Tactical and Technical Trends* (November 1942), German organization included one trained ski company per battalion, and one additional platoon in every other battalion. However, this seems to have been something of a pious hope; at that date this system was 'not put into practice, for German skiers were few and poorly trained'. It was not that the Wehrmacht lacked knowledge: it was training and numbers that so often remained deficient.

TECHNIQUES PERFECTED, 1943–45

By the end of 1943 the major combatant nations had all perfected – or copied – the main elements of winter and mountain tactics and equipment. The Soviets applied winter methods broadly, if sometimes crudely, across their fighting forces. The Germans attempted the same, but were prone to material shortages, and basics such as padded winter uniforms were not available to all.

G

GERMAN WINTER DEFENSIVE POSITION; KARELIA, *c.* 1943

The German 'Mountain Corps Norway' under Gen Dietl moved into northern Finland in June 1941 prior to the invasion of the USSR, and a few days later advanced to attack Murmansk in Operation *Platinfuchs*. This failed, despite repeated attempts and the assistance of Finnish troops. In the course of a desperate defence Soviet forces set fire to forests, and made seaborne landings to outflank the Axis units. In many places this Northern front descended into stalemate, and the Germans – now redesignated as Twentieth Mountain Army – created defensive positions that held out against Soviet offensives in 1942. General Dietl died in an air accident in June 1944; in September the hard-pressed Finns withdrew their co-operation and ordered the Germans out of their territory, attacking their former comrades-in-arms at the end of that month.

This typical battle position, defending a riverbank from attack from the north, is based upon a US intelligence publication. The frozen river, snow-covered close to the bank, gives a clear field of fire. The main forward fortified strongpoint is wired and mined for all-round defence. The fighting positions (see key) are protected by both conventional and electrically controlled mines; the minefields would mostly be detectable to an experienced eye, but at one point in the rear belt the extent of the clear passage to allow reliefs and reinforcements is disguised, and it is flanked by specially concealed mines. Immediate reserves are housed in stone-roofed bunkers in the rear of the strongpoint. In the depth of the position, behind another mine belt, are 81mm mortars, and further strong bunkers wired for all-round defence. One route between the forward and rear positions includes a timber 'corduroy road' across the swamp, and traffic along another stretch is concealed by a camouflage screen.

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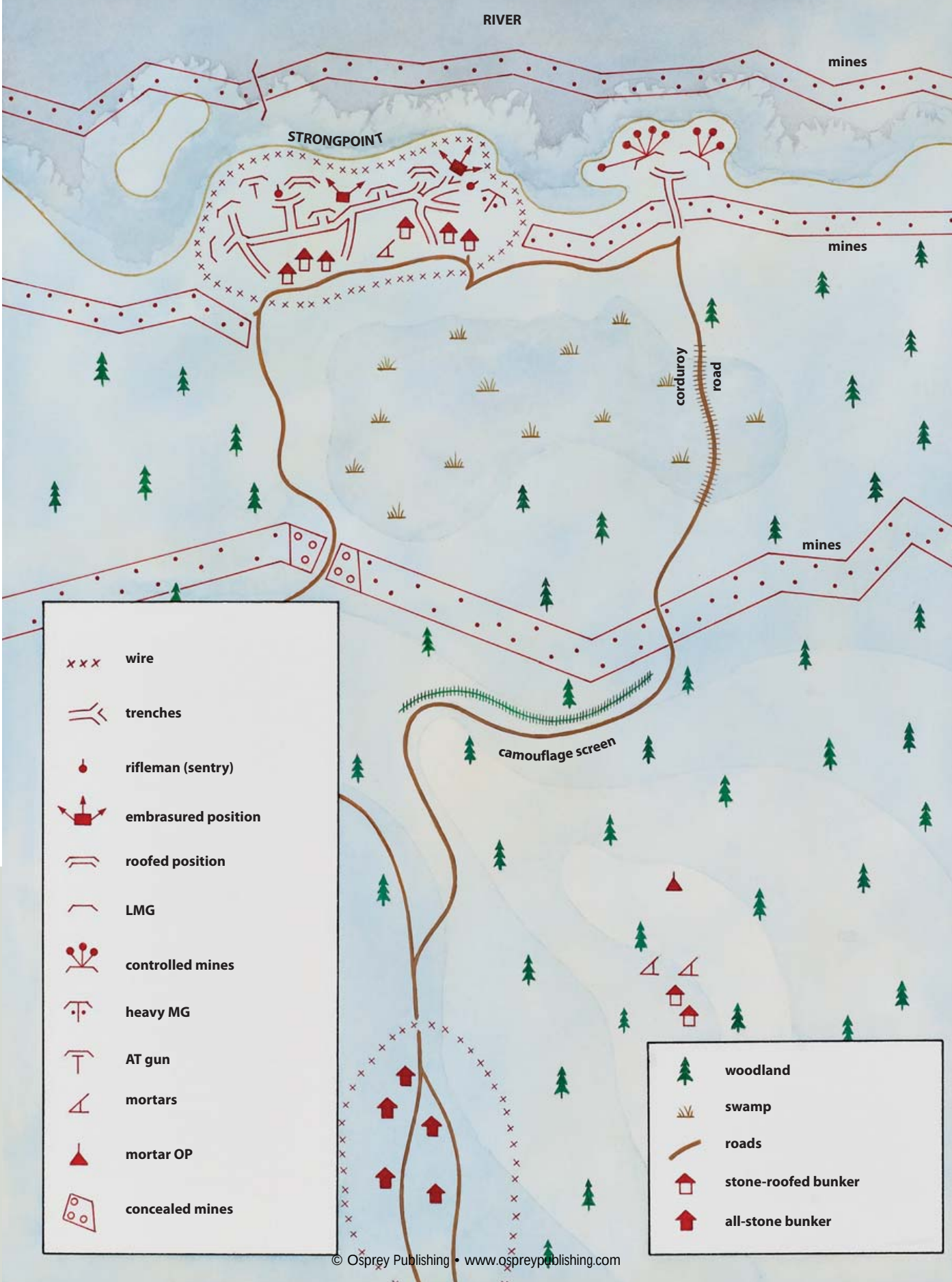

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One version of the 'man-hauling harness' used a broad waist belt and crossed shoulder straps; the small diagram below shows how four skiers should be arranged to pull a sledge. This is from the British 1941 manual *Clothing and Equipment Required in Cold Climates.*

Britain and the US finally created complete mountain divisions, but never deployed them as such. Having trained with Norwegian instructors in Scotland, the British 52nd (Mtn) Div switched to training for the air-landing role in August 1944; it was ultimately judged to be more valuable as a replacement for heavy infantry casualties in North-West Europe, and was sent into the line in the waterlogged fields of the Netherlands in November 1944. The US 10th Light 'Alpine' was rechristened 'Mountain' in 1944, but was the last US division to enter the war in Europe, reaching the front line in northern Italy only at the beginning of 1945. While it did see some mountain fighting that spring before the breakthrough into the Po Valley, the division had already discarded much of its specialist clothing and equipment. It is hard to avoid the conclusion that in both cases the Allied high command decided that holding back these expensively trained and equipped formations in case of a need for their special capabilities was no longer justifiable.

Tactical development and new training had been forced by ever-expanding campaigns; the inspiration was in part Scandinavian, but gained significantly from previous mountain experience. As ever, mountain and cold-weather techniques advanced hand in hand. In the words of the US appreciation in *Handbook on German Military Forces* (March 1945), 'many of the techniques of German winter warfare were developed from those of the mountain troops, which were adapted easily to conditions of extreme cold'. German mountain troops actually formed a significant part of the 'Lapland Army' which continued to fight in the extreme north until late 1944.

Great Britain

British winter and mountain techniques arguably came of age in late 1943, marked by issue of the manuals *Operations in Snow* and *Mountain Warfare*. *Operations in Snow* was interesting in that it had limited objectives, but was to be applied generally. It claimed only to be 'a basis' for the modification of 'normal methods', rather than laying down 'new tactical doctrine'. Nevertheless, it was extensive, and optimistic in the sense that it claimed that 'operations by Russian armies during the past winters have shown that snow and extreme cold may be valuable allies once the resulting problems of organisation and administration have been resolved'. Its main points appear to have been inspired by Finnish, Russian, and German models, as well as by Polar research at Cambridge University. After briefly addressing difficulties of movement, darkness, weather and cold, it went on to cover most of the now familiar material on engineering, shelter, sledges, camouflage, medical matters, skiing, and care of equipment.

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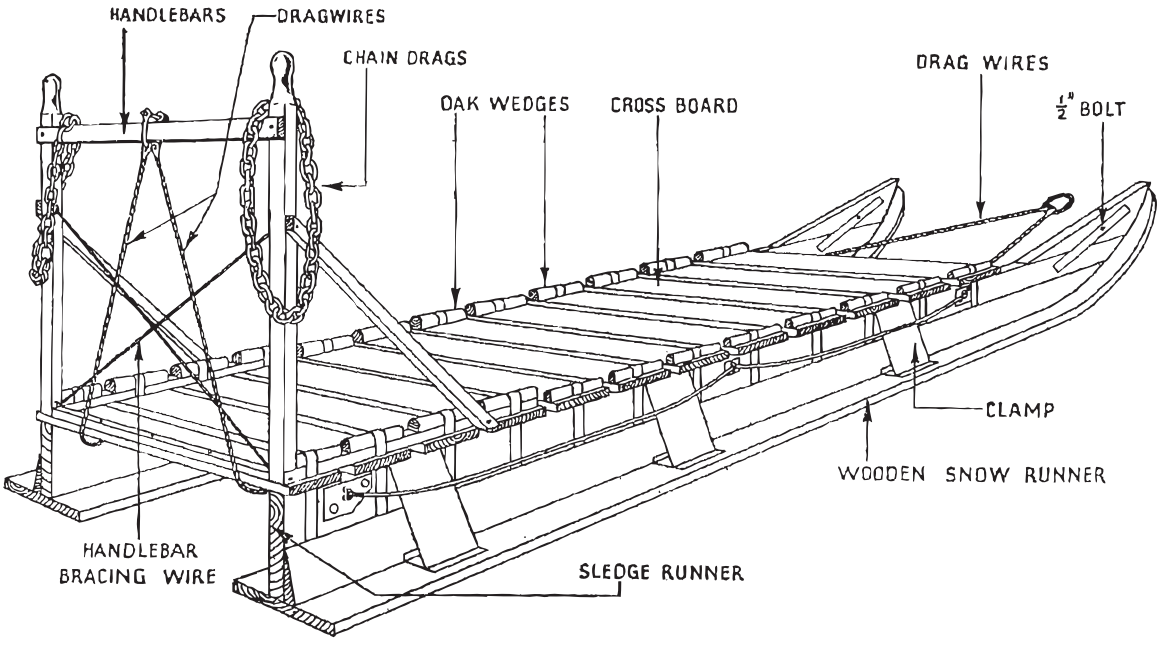

Operations in Snow (December 1943) illustrated the large 'Greenland sledge'; this came in 10ft and – as standard – 15ft lengths, made of ash with metal-shod runners. Towed behind a tractor, its payload was calculated at 112lb for every foot of length over rough going, or up to double this on smooth snow.

For a general manual *Operations in Snow* was detailed, giving, for example, not only advice on skiing on level ground using 'ambling steps', 'poling', 'three-step', 'Finnish' and 'skating' movements', but uphill and downhill methods, and variations of ski turns. There was also information on driving sledges, and the training and care of dogs. To have expected all arms to master such techniques would have been ambitious indeed, so while issue of the 190-page booklet was general to 'all arms of formations concerned', its most significant application was to 52nd (Mtn) Div and particular specialist units.

On tactics, *Operations in Snow* remained of the opinion that basics did not change, but that 'modifications' were necessary to meet peculiarities of climate. On a main axis of advance, ski troops were to be used for early warning to the front and especially to the flanks. In the attack, main targets were likely to be an enemy astride such an axis, and troops on skis and snowshoes were to be used to cut off the enemy retreat, with frontal attacks always to be combined with flanking attacks. Preferably attacks were for limited objectives, and wherever possible preparations, if not the actual execution, were to be by night. Success might well depend on ability to bring forward heavy weapons, which would most likely entail use of infantry and engineers as well as gunners. Though movement of most arms was much slower in snow, 'fully trained' ski troops might be expected to manage 4mph on the flat and as much as 10mph downhill. To attain such performance demanded young troops, preferably under 30 years old, having a physical fitness above that of the 'normal medical category A1'. The 'pre snow' training included activity on grass, physical training, films and lectures, followed by snow training, with movements, patrols and tactical exercises. Ski troops were expected to operate in two-piece white camouflage suits, though interestingly one illustration in the manual shows dark blotches applied for use where snow cover was incomplete.

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Mountain Warfare repeated much of what was already to be found in German and other manuals, though intriguingly it still claimed inspiration from experience on the Indian North-West Frontier. There were a few novelties, however, one of these being the conduct of small-scale attacks in four 'waves' where conditions allowed. Mobility being crucial, attackers were to be lightly equipped and each wave armed as follows:

(a) Men leading the assault with grenades as their only weapon.
(b) Riflemen closely following the leading wave and armed with rifle and bayonet only.
(c) Men armed with light machine guns and sub-machine guns.
(d) Reserves with additional light machine guns and ammunition.

At the end of such an assault the grenadiers and riflemen were to be employed in 'building defences' and bringing up extra ammunition and supplies.

German Mountain Warfare (USA, February 1944)

As of February 1944, US Military Intelligence surveyed the contents of the undated enemy manual *Alpin Technik*, together with other documents, to

H

TRANSPORT IN SNOW, 1942–45

Resupply of essentials such as ammunition and rations to the front lines was always a major problem under the difficult conditions of winter and mountain warfare, and in all armies considerable resources of manpower, animals and time had to be devoted to creating and maintaining supply routes.

(1) German improvised snow-plough. Taken from the 1942 winter warfare handbook, this is simply constructed of timber with an angle-iron cutting nose, and was suitable for clearing snow up to about 50cm (20in) deep.

(2) Use of snow-ploughs. The first plough along the path was pushed, rather than pulled, by two horses harnessed in tandem. It was followed, at intervals of about 100 yards **(red lines),** by two horse-drawn ploughs, one of them consolidating the track and the other widening it. Finally, a one-horse side-plough swept the remaining snow and slush to one side.

(3) German pack pony, 1943–44. German troops throughout the specialized mountain divisions were trained to work with both mules and small Haflinger horses; for example, each 175-man Gebirgsartillerie battery had an establishment of 68 animals to carry its four 7.5cm guns in eight loads each with an immediate supply of 40 rounds per gun. However, experience of the limitations of motorized transport in the Russian autumn rains, winter snow and spring thaw forced all units on the Eastern Front to learn how to make use of sledges drawn by local *panje* ponies. This soldier in the Balkans or Russia is unpacking a local pony rigged with the standard-issue M23 pack saddle (*Tragegestell*). The versatile metal frame had a range of hooks, rings, clamps and shelves to take various load containers, including the large wicker panniers widely used for general cargo; as well as specialized attachments, just about anything could also be roped to its rails. The rig itself was heavy, but the Germans reckoned that a mule could additionally carry a load of about 100kg (220lb), and the less hardy pony some 80kg (176lb).

This soldier, unpacking some winter comforts such as dried soup blocks or drinking-chocolate sent forward in a feed sack along with a load of grenade boxes, illustrates the far higher quality of winter clothing that had been available since winter 1942/43. In this case it is reversible from snow-camouflage white to the Army printed camouflage pattern. He wears a capacious hood/cape combination, under his padded, hooded winter parka and matching trousers; note the matching gauntlet-mittens, some of which had a separated trigger-finger. The trousers tie down over his felt and leather winter boots; unlike those shown in Plate E4, these were designed to be worn in place of, not over, the marching boots.

(4a) & (4b) Improvised pack saddles. Since the M23 saddle was regular issue only to the Gebirgstruppe, the winter warfare manual illustrated these examples of simple alternatives that could be knocked up from scrap timber at unit level, fitted with leather or canvas cinches and padded with hay. Most non-mechanized Wehrmacht formations had thousands of draft horses on their establishment, and replacing the losses after a winter in Russia was always a challenge.

(5) Russian 'snow-boat'. The Red Army employed two main types of *volokushas* – small, versatile cargo platforms that could be towed (by either skiers or dogs) for transporting moderate loads across either deep snow or swamps. One was this boat-bowed plywood type complete with ringbolts and buckles for towing and stowage straps, and hinged compartment-lids in the stern; the other was a double-ended light boat of simple plank construction that could be manhandled even more easily. The Russian 1941 winter warfare manual illustrated several examples of their use, including this one showing a DP light machine gun and its ammunition cans. Another illustration showed how the crew on skis could adopt a prone position on top of and beside the sled (as in Plate F6), and bring the LMG into action without dismounting it.

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create a coherent current picture under the title *German Mountain Warfare*. It was observed that German mountain training had been somewhat diluted since 1939, but at the same time the enemy had realized that not all mountain soldiers needed to be expert mountaineers. Training was given at two levels: the thorough course for elite *Heeresbergführer* (Army Mountain Leaders), and a general course for the remainder. Even the ordinary *Gebirgsjäger* was expected to complete basic infantry training on conventional terrain, followed by a lengthy period in the mountains, during which he would learn (among other techniques) movement over snow in both ordinary footwear and snowshoes. The course also included 20 days in high mountains, with weapons-firing under simulated combat conditions. As a result, though there were different degrees of specialism, mountain personnel were considered specialists, and commonly excluded from normal duties and parades during their specialist training.

For training purposes mountain terrain was classified in five levels of difficulty: easy walking but without paths; difficult walking with steep rock ridges and rugged slopes; easy climbing with exposed grass and rock ridges requiring the use of the hands; moderately difficult climbing, but with good hand and footholds; and 'difficult' to 'extremely difficult', where ascent was only possible with special equipment and techniques. Trainees were gradually advanced in stamina and ability to handle difficulties. Marches and climbs were executed at a relatively slow but rhythmic pace, avoiding straggling and remaining quiet to save breath for movement. Sitting down during descents was avoided due to the danger of slipping, with short steps and zigzags on snow, ice and rock, and the kicking or cutting of steps on steep ice and snow.

Though crampons, ice axes, climbing shoes, pitons and snowshoes were all in general use, weight carried was limited to suit terrain and mission, and the rope was regarded as the key piece of climbing equipment. The standard, green-flecked general issue hemp rope was 30–40m (100–130ft) long, but there were different types. Climbing might be by two men on a rope, or three during training where a *Heeresbergführer* acted as rope leader. A typical set of equipment for two men climbing with one rope included: a piton hammer; three pitons for horizontal cracks, one for vertical cracks, one ring piton and a wafer piton; four karabiners; two pairs of climbing shoes; three cord slings of two different lengths; two small first aid kits; a rucksack; compass; map; torch; and altimeter. Techniques learned including belaying; roping down, as perhaps to negotiate an overhang; and the use of the ice axe as walking aid, during climbing as a hand or foothold, and as a brake. During the course troops were also expected to bivouac on ledges, understand and avoid rock falls and avalanches, and read and take into account weather conditions.

Candidates for *Heeresbergführer* were generally singled out after initial training on snow from competent skiers with mountain aptitude, and formed into special squads for rigorous training. They were expected to excel in choice of routes, acting as rope leaders during climbing, and in skiing, being given increasing loads to carry on the slopes. Orienteering, map reading, rescue techniques, and recognition of dangers such as avalanches also formed important parts of the course. On the recommendation of the director of training, acting on instructors' reports, qualified *Heeresbergführer* were granted a special badge to be worn on the left breast. On operational deployments they were allotted as guides and as advisors to non-specialist officers. In 1942 and 1943 they were also used to form four battalions of 'high mountain' troops – the *Hochgebirgsjäger*. They received no additional

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rank or pay for being mountain leaders, but were likely candidates for promotion.

Given the 'compartmented' nature of mountain terrain and its communication difficulties, the reinforced mountain infantry battalion remained the basic tactical unit. Under the organization of January 1944 this comprised three mountain rifle companies, plus a machine gun company, a heavy weapons company, and battalion staff. Firepower included 42 LMGs, 12 HMGs, six 80mm and four 120mm mortars. The parent regiment and division also had specialist assets such as reconnaissance, mountain artillery, engineers, signals and medical, bakery and butchery companies, these being allotted to the battalion as required.

Tactics during the last phase of the war were neatly summarized by *Handbook on German Military Forces,* as follows:

> The Germans divide their units into numerous marching groups, which normally consist of a reinforced infantry company, an artillery battery, and an engineer platoon. In this manner the Germans counteract the danger of ambush, since each group is able to fight independently. The Germans locate their engineer units well forward with the advanced guard so that they may assist with road repairs. The Germans realise that small enemy forces can retard the advance of a whole column and therefore they have single guns sited well forward; they also organise stationary and mobile patrols for flank protection… The Germans make extensive use of high trajectory weapons in mountain fighting, although anti-tank guns and heavy machine guns are used for covering road blocks.

Germany, January 1945: British recce patrol wearing snow-camouflage helmet covers and two-piece suits. The leader and his radio operator (almost hidden behind him) have also camouflaged the Sten gun and the backpack radio with white cloth.

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Casola Valserio, Italy, February 1945: Men of 85th Mtn Arty Regt, Royal Artillery, unloading shells from mule panniers in a hill position. A single light howitzer shell weighed about 20lb, so over long distances eight shells was a viable mule. Apart from their 'payload', pack animals also needed to transport their own fodder. Their daily requirement, depending on their size, was from about 6lb up to 12lb, preferably of oatmeal and forage-cake.

Mountain attacks were usually made to 'protect the flanks of a main attack, to work around the enemy rear, or to provide flanking fire for the main attack'. In order to do this attempts were made to seize commanding heights and passes. Assembly areas for attacks were as close as possible to the enemy in order to make short assaults, and support weapons were attached down to company, and if possible platoon level. Advanced positions were organized on forward slopes, but 'the main battle position with heavy support weapons' was located on the reverse slope, often with a substantial reserve. This necessitated relatively narrow sectors, but was favourable to making counterattacks. Given resupply problems, the husbanding of ammunition, particularly for heavy weapons, was vital. As the US *Intelligence Bulletin* of March 1944 remarked, 'fewer weapons and more ammunition is the German principle… Since ammunition presents a difficult problem in mountain warfare, the usual German procedure is to fire only on orders. Single rounds are aimed with the greatest care, for considerations of economy as well as effect.'

CONCLUSIONS

In the Europe of 1939 winter warfare skills were highly developed only in the Scandinavian armies. Lack of comprehensive doctrine was perhaps forgivable in Britain and France, where no requirement for prolonged winter fighting could easily be foreseen. In the Red Army and German Wehrmacht – given geoclimatic realities, and a desire to wage wars of conquest – unpreparedness was both bizarre and catastrophic. The Soviets eventually defeated the vastly outnumbered Finnish defenders in the Winter War of 1939–40, but the costly and frequently incompetent manner in which they did so revived, in many countries, an interest in the tactics of cold-weather warfare. The lessons learned had import both for the development of training and equipment, and on the course of the war itself – on the one hand, German observers formed the impression that the Soviet Union could easily be beaten; and on the other, the Russians realized that their approach required total and immediate revision.

Mountain warfare skills were also at a premium in 1939, but in this instance there were pockets of advanced practice in several of the major armies, notably the French Chasseurs Alpins, and amongst a small number of British and US officers with experience, for example, of the mountains of the Indian frontier and the Americas. Clear leaders in the field, however, were the Germans; the long-term interest in Alpine sports centred in Bavaria, and the annexation of Austria in 1938, facilitated the formation of whole divisions of Wehrmacht mountain troops. Even so, both mountain and winter techniques still continued

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to be regarded as specialist skills, requiring the attention only of specific bodies of troops. The Russo-Finnish Winter War, and, more importantly, experience on the Eastern Front in 1941/42, altered such complacent perceptions dramatically. In the words of Gen von Greiffenburg, chief of staff to German Twelfth Army, 'The effect of climate in Russia is to make things impassable in the mud of spring and autumn, unbearable in the heat of summer, and impossible in the depths of winter. Climate in Russia is a series of natural disasters'.

It has frequently been said, largely on the basis of the winter 1941/42 campaigns, that the Red Army was vastly superior to the Wehrmacht in winter warfare techniques. While there is much truth in this, and the Russsians had clearly learned much, especially from the Finns, this statement still requires qualification. While German preparation, equipment, and doctrine were all sadly lacking in 1941, the best German and Austrian skiers were already more than a match for their Soviet opponents, and the Red Army regularly suffered greater losses than their enemy. Sometimes Russian ski tactics were faulty, and numbers were no guarantee of success. In 1942, for example, Gen Raus recorded an attack by a Red Army ski brigade over a slope in daylight that resembled a 'winter sports show', brought to an 'unfair conclusion' by machine-gun fire and a flank attack by assault guns. On that occasion Soviet losses totalled more than 550, including the staff officer of 39th Guards Army in charge of ski training.

By 1943, albeit too late to have any decisive effect, German winter techniques and technology had largely caught up. Interestingly, that same year the Finnish Field Marshal Mannerheim paid his German colleagues the sideways compliment of telling them that not only had the Soviet enemy learned from the Winter War, but in terms of general tactics they had since learned much from the Wehrmacht, as for example in attacking and enveloping boldly and aggressively. Nevertheless, after the first winter campaign in 1941/42 perceptions had changed: as Russian infantry platoon commander Anatolij Tschernjajew put it, a once-mighty enemy had been seen unprepared, and now 'miserable, half naked and hungry in front of Moscow'. The impact of this spectacle in restoring Soviet morale would never be wiped out by later German improvements.

As late as the summer of 1942 official German teaching was that there *were* no special winter tactics, and despite some improvement in the provision of clothing and equipment widespread improvisation would still be necessary the following winter. At the same time, misleading assessments of Soviet abilities and powers of resistance were endemic, and sometimes deliberately disseminated as propaganda. General Halder referred to a 'chronic tendency' to underestimate the enemy, which is perhaps

Over the broad mass of armies the provision of special winter clothing was always uneven even late in the war; there were often complaints from the front lines that the more desirable items tended to stick to the rear-area personnel. Here, during the Battle of the Bulge, an NCO from US 2nd Armd Div is muffled up warmly enough in a mackinaw over his lined tanker's jacket and bib-front overtrousers, and has improvised a mask against the biting December wind.

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Most of these GIs in the Belgian woods late in the Ardennes fighting have two-piece hooded snow suits, fastening with front tie-tapes – these were reckoned easier to handle with gloved hands than buttons. They are operating a light sledge relay for stores and casualties. Note the great depth of the wind-driven snow drifts.

confirmed by Gen Raus's claim that one of the key advantages of the Germans was that 'the intelligent German soldier wanted to know what he was fighting for and what significance the mission of his respective unit had… He was an independent, individualistic fighter and felt far superior to the Russian soldier, who was trained for mass commitment'. Yet after the 'Stalingrad winter' of 1942/43 German military censors were reporting to Goebbels that 57 per cent of correspondence was skeptical or derogatory about the conduct of the war, 33 per cent indifferent, and only a tiny percentage of letter-writers were fully behind the senior direction of the conflict. As Gen Halder observed, this had serious morale and practical implications – for the regime, as well as for the Army.

It may be suggested that early in the war the Allied armies made many of the same mistakes of ommission as their Soviet and German counterparts, the fate of Norway being a particular tragedy in Britain's case. Fortunately, however, neither of the major Western Allies was embroiled in a mountain campaign until the winter of 1943/44 in Italy, nor in protracted winter fighting until late 1944 in North-West Europe; by that stage they had taken aboard the main lessons of earlier failures, and their remaining shortcomings could not significantly influence the outcome of the conflict. That the development of winter tactics did impact significantly upon the course of World War II, particularly in Scandinavia and on the Eastern Front, is, however, undeniable, and it is a subject worthy of further research.

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The German 7.5cm gebG 36 mountain howitzer that equipped Gebirgsartillerie units in the Mountain Divisions was recognizable by its unusual muzzle-brake, and had a variable recoil feature. In high mountain terrain guns usually had to be emplaced singly, so their effectiveness depended on careful selection of observation posts in reliable communication with the single gun positions.

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FRONT COVER German Gebirgsjäger manning an MG34 on the sustained-fire *Lafette 34* mount. The gunner, keeping watch through an optical sight, wears all-over snow camouflage complete with a coloured quick-identification band around the arm. Long-range machine-gun fire in mountain terrain was particularly tricky; both great differences in elevations between gun and target, and wind conditions, made accuracy difficult to calculate.

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